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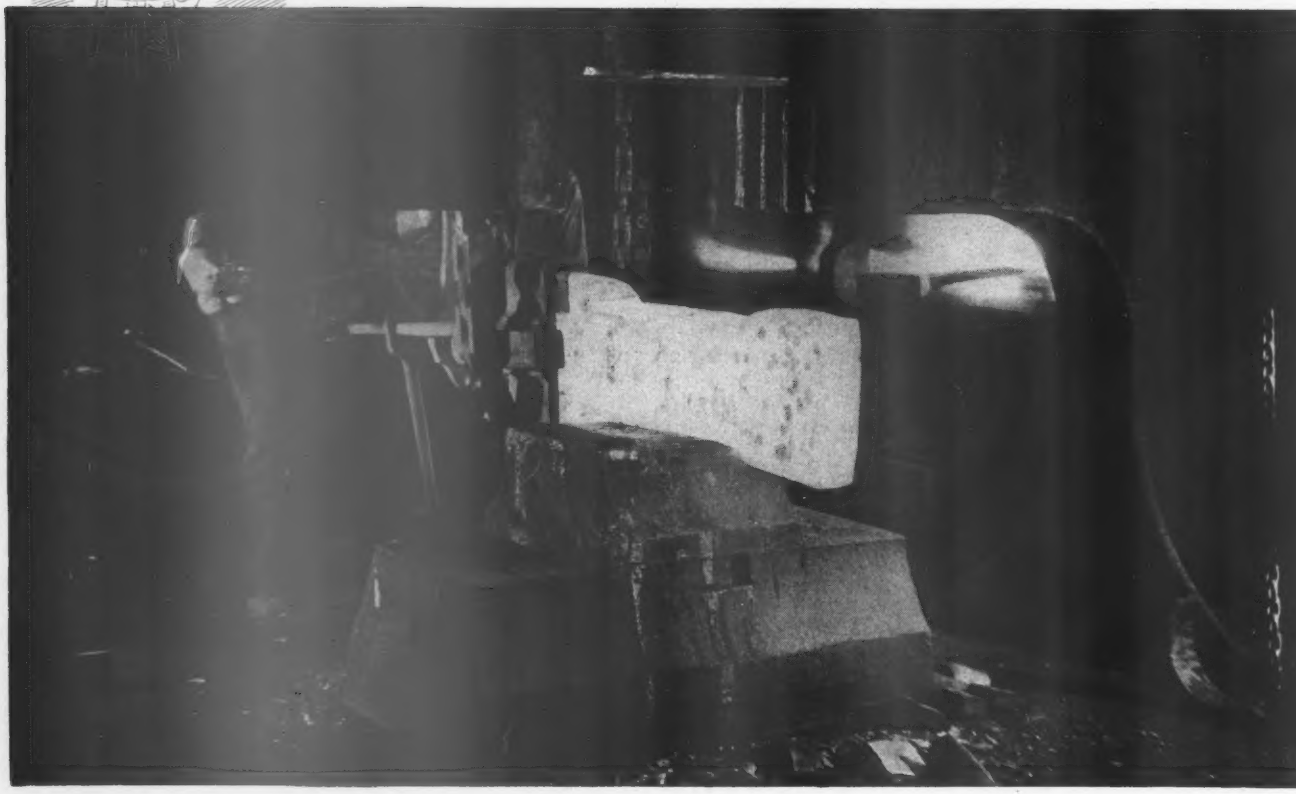
DRIVING RODS

are a weight y problem



Driving rods are as essential as the wheels they turn but their weight creates a counterbalance problem and is an important factor in train speeds. » » » This element, however, is minimized by use of the higher strength, lighter section that Agathon* Alloy Steel provides. » » » Agathon Alloy Steel for reciprocating and revolving parts permits designing for higher train speeds and increases dependability of performance and safety of operation. » » » Whatever the service, roundhouse, shop or rolling stock, there is a Republic steel, either alloy or plain carbon, to meet the needs. Our metallurgists are at your service. Address Department RG. » » »

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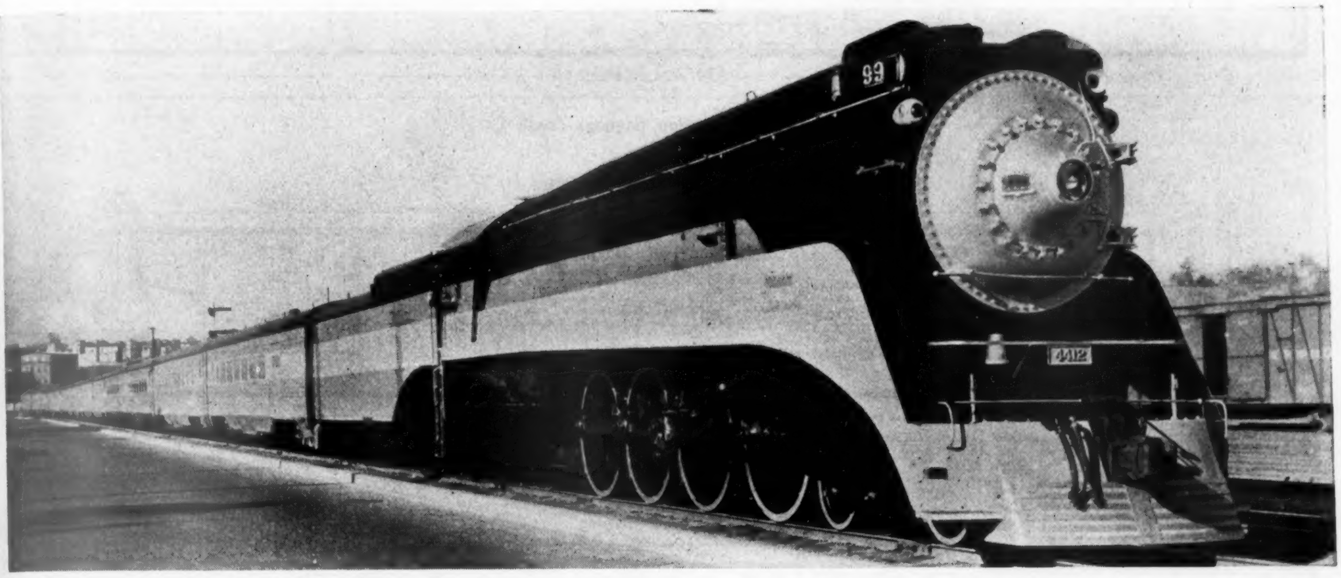


One of the Southern Pacific "Daylight" streamliners at Los Angeles, Calif.

Pacific Coast Streamliners

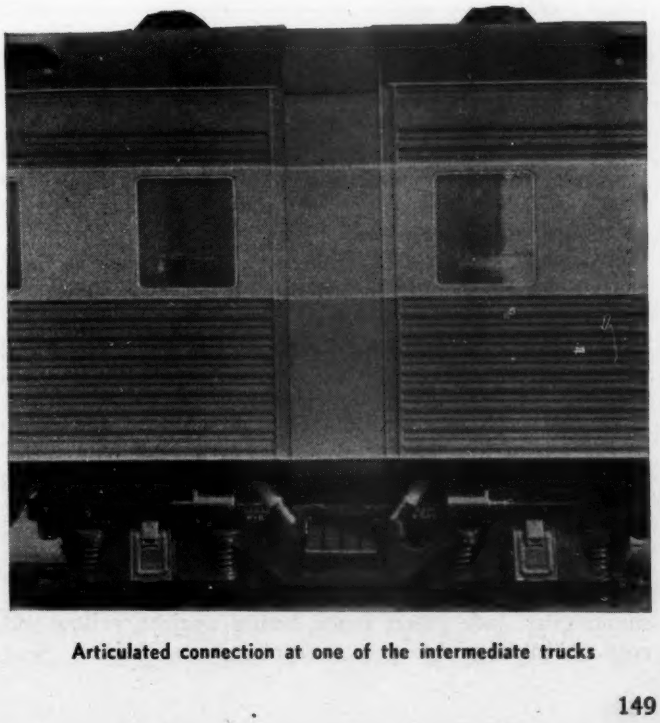
Southern Pacific gets complete new equipment for the Daylight. Cars of light-weight construction built by Pullman-Standard

THE Southern Pacific has recently placed in service two new 12-car trains, built by the Pullman-Standard Car Manufacturing Company, Chicago, and comprising complete new car equipment* for the well-known "Daylight" trains which operate between San Francisco, Cal., and Los Angeles. The consist of each of the trains is identical, as given in the table, and includes one baggage-coach, seating 44; one full coach, seating 48; six coaches, articulated in units of two, seating 50 passengers per car; a tavern car, seating 42; a diner, seating 40; a parlor car, seating 33; and a parlor-observation car, seating 41; or a total seating capacity of 548. The 12 cars have a coupled length of slightly over 870 ft. and a light weight of 1,144,340 lb., or fully one-third less than conventional riveted steel cars. The weight of each train, including the locomotive, ready for service, is 2,028,551 lb.; and each train cost approximately $1,000,000.

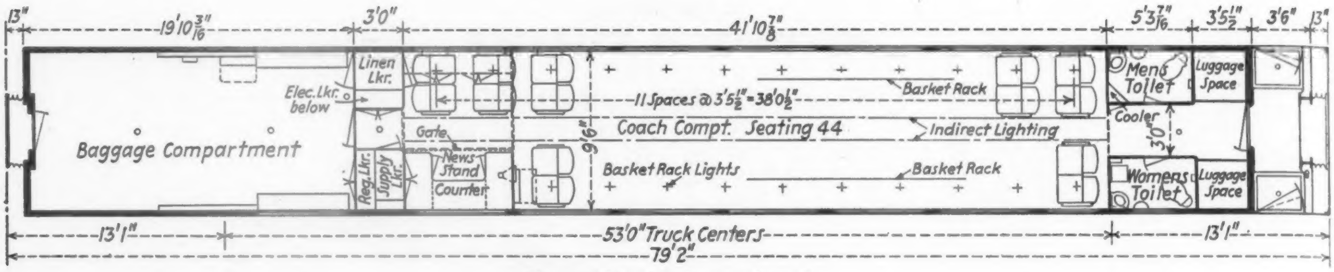
The inside width of the cars is 5¼ in. greater than that of conventional equipment. Although the total height of the cars has been decreased 6 in., thus lowering the center of gravity 9½ in., the new cars provide full standard headroom from floor to ceiling. The lower center of gravity is designed to provide greater safety and riding comfort at high speeds.

The strength members and roof sheets are made of Cor-Ten steel, having an ultimate tensile strength of 75,000 lb. per sq. in. The entire framing of each car is assembled by welding. Sheathing is of light-weight stainless steel having an ultimate tensile strength of 110,000 lb. per sq. in. Aluminum is also used ex-

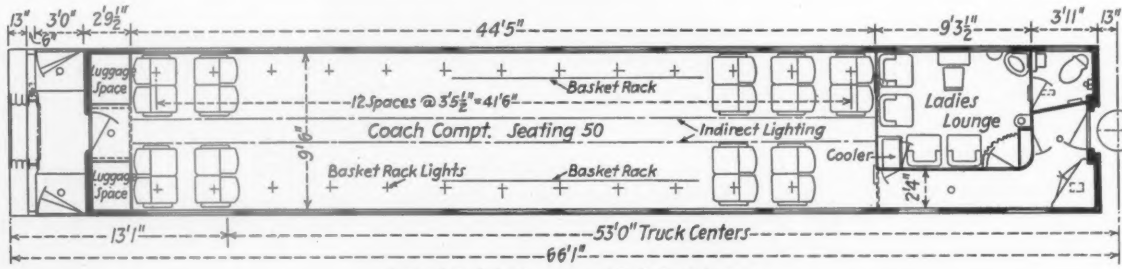
* New streamline steam locomotives, built by the Lima Locomotive Works, Inc., and designed to haul these trains in modern high-speed service, were described in detail in the March *Railway Mechanical Engineer.*



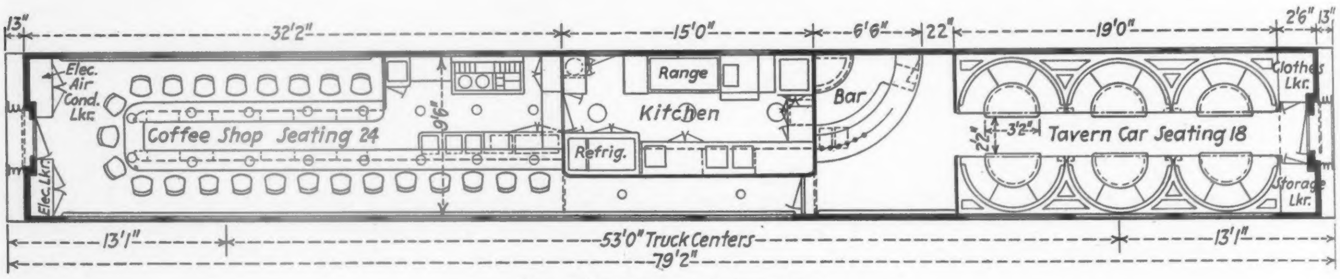
Articulated connection at one of the intermediate trucks



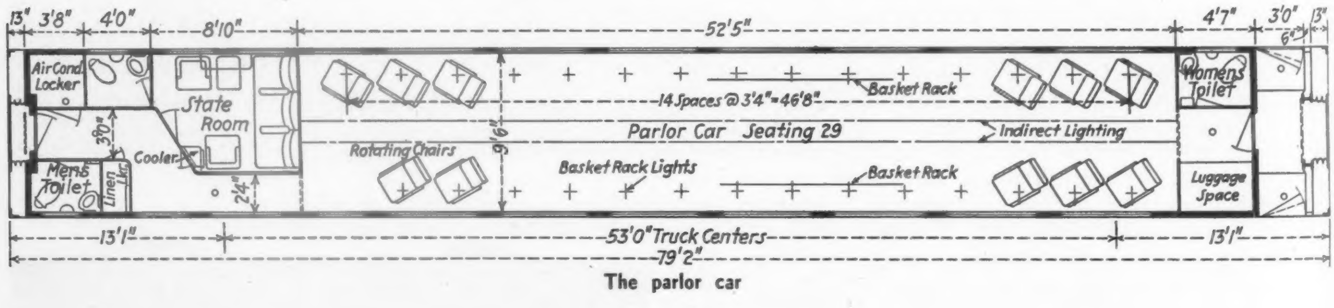
The combination baggage-coach



Articulated body unit with ladies' lounge



The coffee shop and tavern car



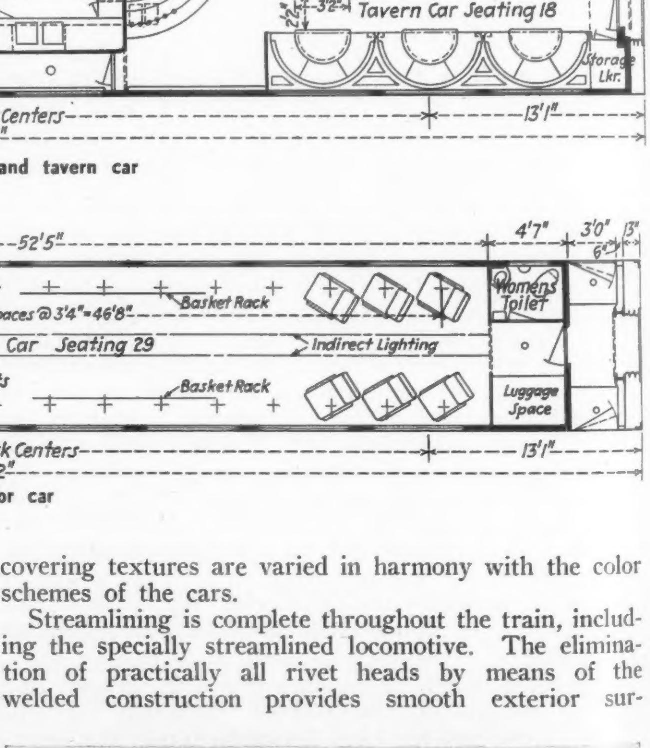
The parlor car

tensively for interior trim and decorative purposes. The walls and roof are insulated with a special light-weight material, and floor insulation is of pressed cork. The inside finish is pressed wood, and Plymetl is used in all doors and partitions.

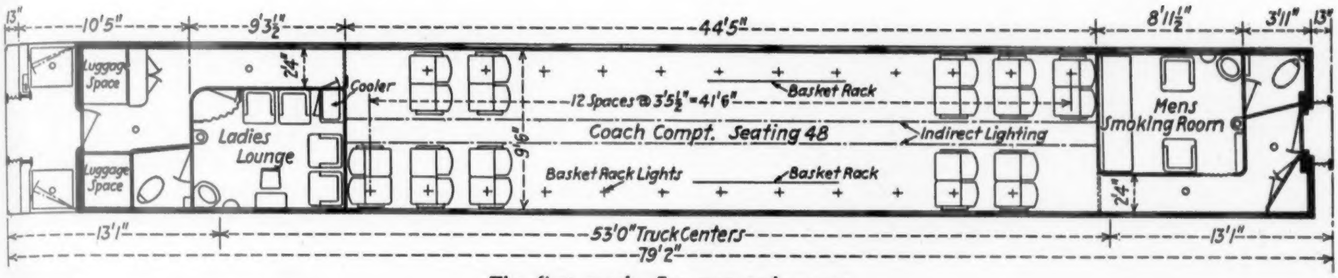
The exterior color scheme provides a wide orange, red and black striping which sweeps the entire length of the train, including the locomotive, and emphasizes the sleekness and streamlining. The roof and lower skirting are black; the letter board below the roof line is red; the section from the letter board to the window sills is orange; and the section from the window sills down to the top of the skirting is red. Horizontal trim moldings above and below the windows are finished in aluminum bronze.

The interior color scheme consists of individual cars harmoniously styled in striking combinations of cream, Nantes blue, light tan, brown, coral, orange, terra cotta, smoke gray, jade green, ivory, henna, apricot, yellow and rust. Moldings have a satin-aluminum finish. Seat covering textures are varied in harmony with the color schemes of the cars.

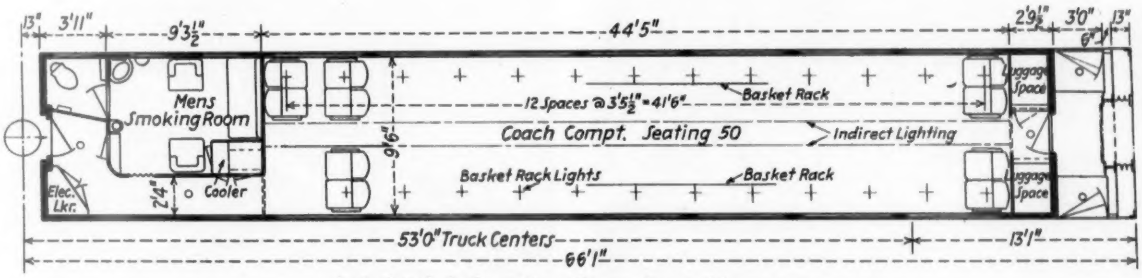
Streamlining is complete throughout the train, including the specially streamlined locomotive. The elimination of practically all rivet heads by means of the welded construction provides smooth exterior sur-



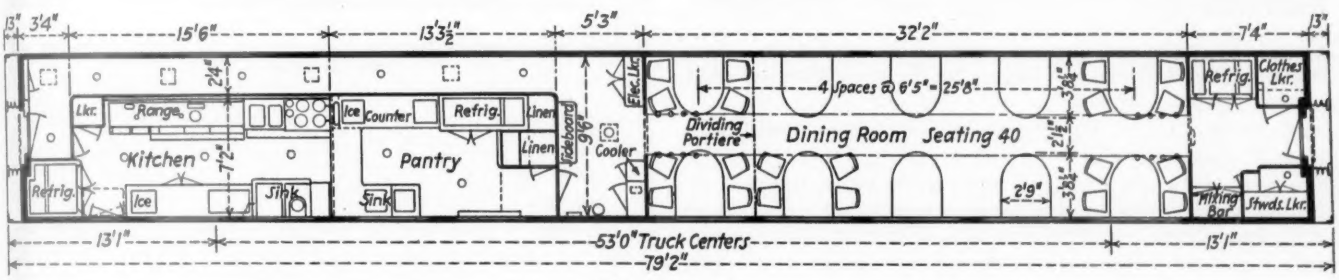
One of the trucks showing the arrangement of the generator drive



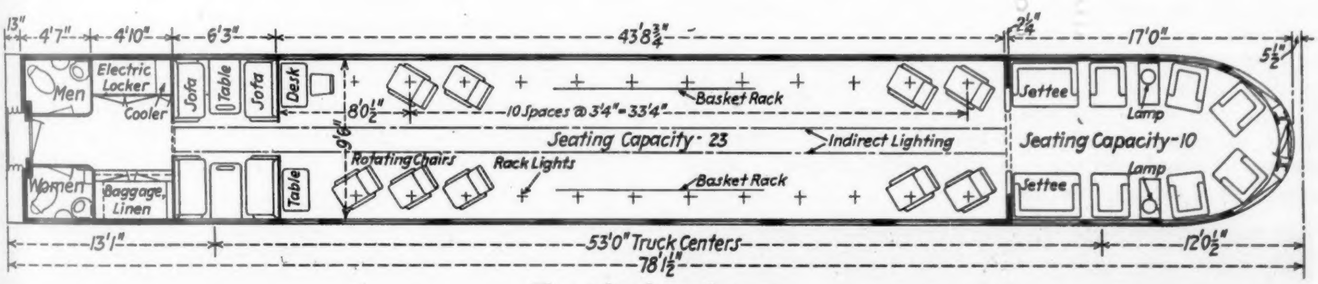
The first coach—For men and women



Articulated body unit with men's smoking room



The dining car



The parlor-observation car

faces on all cars. A lower skirt, curving under the cars, covers all running gear except the trucks and gives a tubular appearance to the train. Rubber diaphragms, painted to conform to the exterior color scheme, cover the gaps between all cars to provide an unbroken exterior surface the length of the train. Car steps, when closed, follow the contour of the curved skirting plate. Marker lights and back-up light are streamlined and molded into the contour of the car body.

Consist of the New Daylight 12-Car Trains of the Southern Pacific

No. of cars in each train		Length overall per car	Light weight per car	Seating capacity per car
1	Coach, baggage	79 ft. 2 in.	102,500 lb.	44
1	Coach for women and men	79 ft. 2 in.	101,980 lb.	48
3	Coaches for women only*	66 ft. 1 in.	86,260 lb.	50
3	Coaches for men only*	66 ft. 1 in.	84,206 lb.	50
1	Tavern car	79 ft. 2 in.	113,820 lb.	42
1	Diner	79 ft. 2 in.	112,680 lb.	40
1	Parlor car	79 ft. 2 in.	102,620 lb.	33
1	Parlor-observation car	78 ft. 1½ in.	99,340 lb.	41
	Total train car length	870 ft. 5½ in.		
	Total train car weight		1,144,340 lb.	
	Total seating capacity			548

* Each men's and women's coach is articulated at one end, the two cars forming a unit. The weight given is the average for the three cars.

Air-conditioning is complete throughout the train, embodying the latest developments of the steam jet system. Windows are double paned and sealed. Gaps between cars are closed by double diaphragms. The Vapor steam heating system embodies fin-type radiation. All main windows are exceptionally wide for maximum visibility. All inner sash are glazed with clear safety glass, outer windows being sealed against dust and smoke.

A system of indirect lighting is employed in all cars, furnishing primary illumination in diner and settee section of the tavern car and secondary illumination in coaches and parlor cars. Primary illumination in coaches and parlor cars is from individually controlled lights in the parcel rack over each seat. The ceiling structure, enclosing the indirect lighting, is of simple, pleasing design. The bar section of the tavern car

An example of interior construction showing the method of applying insulation—Duct openings in ceiling are for the air-conditioning system

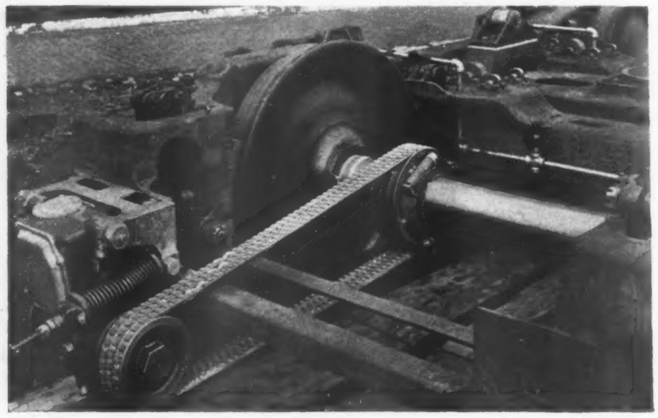
features spectrum lighting which changes constantly through various colors.

Coach seats are of the rotating reclining type, permitting passengers to face in any direction. Parlor car and observation room chairs are of the rotating, non-reclining type. All chairs are of ultra-modern design, on a framework of metal tubing and fitted with sponge rubber seat and back cushions, displacing the conventional spring cushions, making for greater passenger comfort.

The tavern car is divided into two sections, a tavern section with bar, and a coffee shop section. The bar is a quarter circle, backed by mirrors which give a full-circle illusion. Spectrum indirect lighting changes constantly through yellow, red and blue colors. Settees are of semi-circular design.

Occupying half of the tavern car, and separated from the bar section by an aluminum and glass partition, the coffee shop features a horseshoe counter surrounded by 24 stools. The interior width of this car, like other cars of the new "Daylight," is 5¼ in. greater than usual, thus for the first time making possible the installation of a horseshoe counter design.

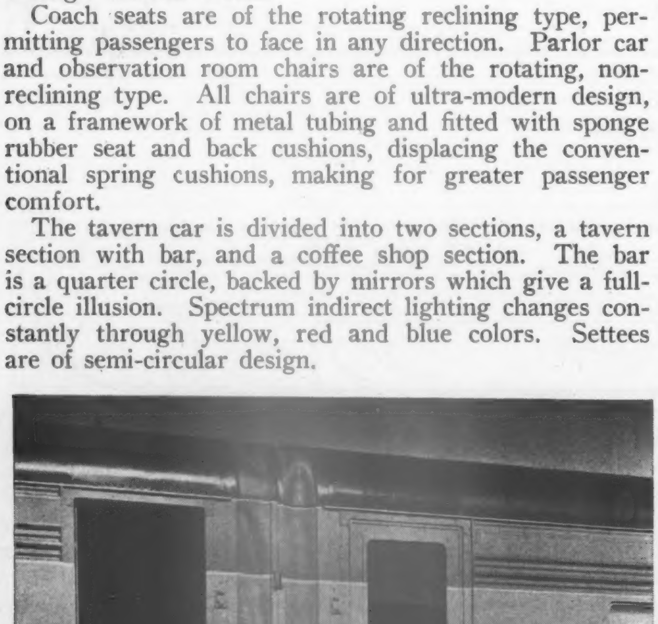
The rear end of the parlor-observation car is oval in



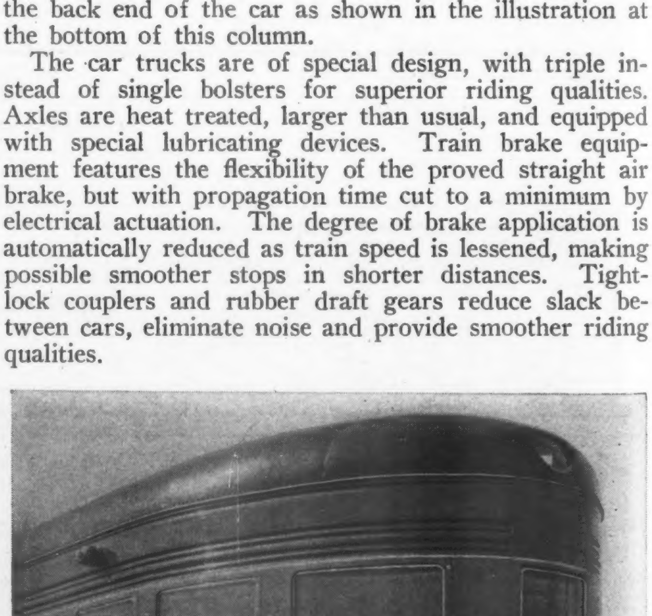
Electric speed control for the brake system, as driven from one of the car axles

shape in keeping with the streamlined train design. Windows, following this contour, extend entirely around the back end of the car as shown in the illustration at the bottom of this column.

The car trucks are of special design, with triple instead of single bolsters for superior riding qualities. Axles are heat treated, larger than usual, and equipped with special lubricating devices. Train brake equipment features the flexibility of the proved straight air brake, but with propagation time cut to a minimum by electrical actuation. The degree of brake application is automatically reduced as train speed is lessened, making possible smoother stops in shorter distances. Tight-lock couplers and rubber draft gears reduce slack between cars, eliminate noise and provide smoother riding qualities.



Non-articulated car connection with spot-lighted vestibule steps, open and closed



The rear end of the train

Report of the Union Pacific

Streamliner Brake Trials

Tests on "City of San Francisco" demonstrate the general performance of A H S C brake equipment and effectiveness of deceleration control

Before the Union Pacific high-speed streamline train "City of San Francisco" was placed in service, the New York Air Brake Company and Westinghouse Air Brake Company, in cooperation with the Union Pacific, conducted tests on the A H S C brake equipment with which this train and also the "City of Los Angeles" is equipped. The City of Los Angeles, the first high-speed train to be equipped with the later type A H S C equipment had been placed in service previously, and therefore was not available for tests.

The City of San Francisco was made available for only one day for these tests. The tests were particularly intended to demonstrate the general performance of the air-brake system as a whole, the functioning of the equipment in straight air (electro-pneumatic) and in automatic control, and the effectiveness of the deceleration control as provided by the Decelakron. Stop-distance records at various speeds with different types of brake applications were to be made to obtain actual data on the effectiveness of the brake system.

The City of San Francisco (described in the September, 1936, issue of the *Railway Mechanical Engineer*) comprises two 1,200-hp. locomotive units, one mail-baggage car, one dormitory-baggage car, one diner-lounge car, four sleepers, one coach and one coach-buffet car. The truck arrangements and weights on each truck are shown in Table I. The wheels on all of the cars were made by the Illinois Steel Company of rolled steel, oil quenched and drawn to a Brinell hardness of between 275 and 285. These wheels had the standard A.A.R. taper tread. With the vertical loading of the power car wheels on the worn rails in the territory involved, the bearing area should represent approximately 0.73 sq. in.

The brake shoes were all of the plain or non-flanged type made by the American Brake Shoe & Foundry Company. The power-truck shoes are designated as "Pattern 4396, Diamond S type S B;" they are unchilled, are 3⅜ in. wide by 11 in. long and have an area of 37,125 sq. in. The shoes on the other trucks are designated as "Pattern 4411, Diamond S type S B;" they are 3⅜ in. wide by 9 in. long, and have an area of 30,375 sq. in. Brinell hardness of the shoes is 300. There were four shoes per wheel on each of the 14 trucks.

Description of Equipment

The air-brake equipment used on these trains is a modification of the standard H S C equipment which had previously been furnished on high-speed trains by both the air-brake companies. The modification consists in a rearrangement of the motor-car control units to permit the brake apparatus to be operated as a high-speed straight-air system or a conventional automatic system. This change is accompanied by the incorporation of a change-over valve as a part of the HS-4 brake valve. The change-over valve is moved by the use of the standard brake-valve handle to either straight-air or automatic position as desired. The HS-4 brake valve operates in conjunction with the BA-4 brake application valve, an EP-2 master relay, a Decelakron, and the necessary train-control apparatus. The train-control features function automatically to cause brake applications irrespective of the setting of the change-over valve.

The normal operation of the equipment on high-speed trains will usually be in straight air. During this operation the engineer's brake valve is the means through which the engineer initiates the brake application by admitting air to a fixed-volume reservoir which allows pressure to act on the master relay to energize the application magnets simultaneously throughout the train. Releases are accomplished similarly by means of the control valves, through the master relay.

Each car in the train, including the control units, is equipped with a No. 21 control valve and magnet valve. The No. 21 control valve is the device through which air is admitted to the brake cylinders or released directly therefrom as pressure is developed or reduced in a straight-air pipe by operation of the application or release magnet. When the desired amount of brake application is secured, the Decelakron operates to regulate the degree of application, and to maintain a uniform rate of train deceleration. Thus, after the engineer once initiates a brake application, the Decelakron assumes control to reduce the degree of brake application to maintain a safe margin against wheel sliding.

The initial settings of the Decelakron were as follows: (a) Minimum service, 2 m.p.h. per sec. at full-open position; (b) maximum service, 2.5 m.p.h. per sec. at full-open position; and (c) emergency, 3 m.p.h. per sec. at full-open position. The train was also equipped with conductor's valves whereby the trainmen may make emergency brake applications if found necessary. A backup-valve arrangement was also provided in the last car to permit a trainman to make a service or emergency brake application from that point.

Description of Test Track

All tests were made on the Union Pacific Railroad between Omaha and Columbus. This is a distance of approximately 85 miles, and tests were made running both westward and eastward. Included in this 85 miles run were two sections of track which were staked out for the measurement of stopping distances. Two high-speed test stops were made over these measured sections running westward and two running eastward.

In general the track was slightly ascending when running westward and had Sherman gravel ballast practically all the way. The test stops were made on tangent track. The rail in the test territory represents standard section, weighing 101.48 lb. Part of the rail was laid in 1920 and part in 1923. The chemical properties of the rail are as follows: Carbon, between 0.67 and 0.83 per cent; manganese, between 0.50 and 0.90 per cent; phosphorous, 0.04 per cent; and silicon, 0.15 per cent. The original Brinell hardness of the rail was approximately

285 and would now be considered an average of 300 due to service peening.

Test Instruments

Practically all of the test apparatus and test control equipment were located in the baggage compartment of car 3. This was really the first car in the train, but since each of the two locomotive units had equipment similar to that of the cars, each of these units is counted as a car, thus making an 11-car train. The equipment in car 3 consisted of one trainagraph, one speed-time recorder, one decelerometer, a control panel, and a time clock. Wires extended from this car to the hunch mechanism, which was located on the top of the brake valve in the engineman's cab. Four wires were run through the train to the rear. Two of these wires provided a power circuit for the trainagraph, and the other two wires furnished the hunch and time circuit for instruments located in car 11.

The trainagraph, located in car 3, recorded brake-pipe, brake-cylinder, supply-reservoir, and straight-air pipe pressure. The brake-pipe connection was taken from the bottom of the filter. The brake-cylinder connection was taken from a tapped opening in the B relay valve at the No. 21 control valve. The supply-reservoir pressure connection was taken from the top of the auxiliary-reservoir by-pass check valve. Straight-air pipe pressure was taken from the face of the B relay valve at the No. 21 control valve. The trainagraph located in car 11 recorded similar pressures except that no supply-reservoir pressure connection could be obtained conveniently at this location.

The speed-distance recorder located in car 3 was of the spark type, being controlled from contacts located on the right end of the front axle of truck No. 6. The contactor normally provided one break per revolution with the option of obtaining six breaks per revolution at the lower speeds. This change-over could be accomplished from the control panel. Another solenoid type of speed-distance recorder was located in car 11. The circuit which controlled the recording arm movement on this instrument was provided from a tracer pulley-type contactor located at the center of the rear axle of truck No. 14.

Table I — Train and Braking Ratio Data

Type of car	Truck no.	Weight ready to run, lb.	Actual lever ratio	Total shoe force	Brake ratio at 100 lb. brake-cylinder pres.	Brake shoes: No. per wheel	Brake shoes: Width, in.	Brake shoes: Length, in.
Power	1	112,980	7.96	250,070	222.0	4	3⅜	11
	2	101,960	7.24	227,360	223.5	4	3⅜	11
Power	3	101,960	7.24	227,360	223.5	4	3⅜	11
	4	113,540	7.96	250,070	220.0	4	3⅜	11
Mail car	5	58,560	4.68	147,000	251.0	4	3⅜	9
	6	56,260	4.78	150,100	267.0	4	3⅜	9
Baggage car..	7	64,760	5.37	168,800	261.0	4	3⅜	9
Diner-lounge..	8	65,540	5.37	168,000	258.0	4	3⅜	9
Sleeper	9	70,980	5.83	183,000	258.0	4	3⅜	9
Sleeper	10	67,540	5.62	176,600	262.0	4	3⅜	9
Sleeper	11	71,460	6.01	188,800	265.0	4	3⅜	9
Sleeper	12	67,800	5.55	174,300	257.0	4	3⅜	9
Coach	13	62,980	5.20	163,400	260.0	4	3⅜	9
Coach-Buffet .	14	47,980	5.09	78,400	164.0	4	3⅜	9
Totals		1,064,300		2,554,060	240-mean			
Added weight on test run		8,500						
Total for test		1,072,800			238.1-mean			

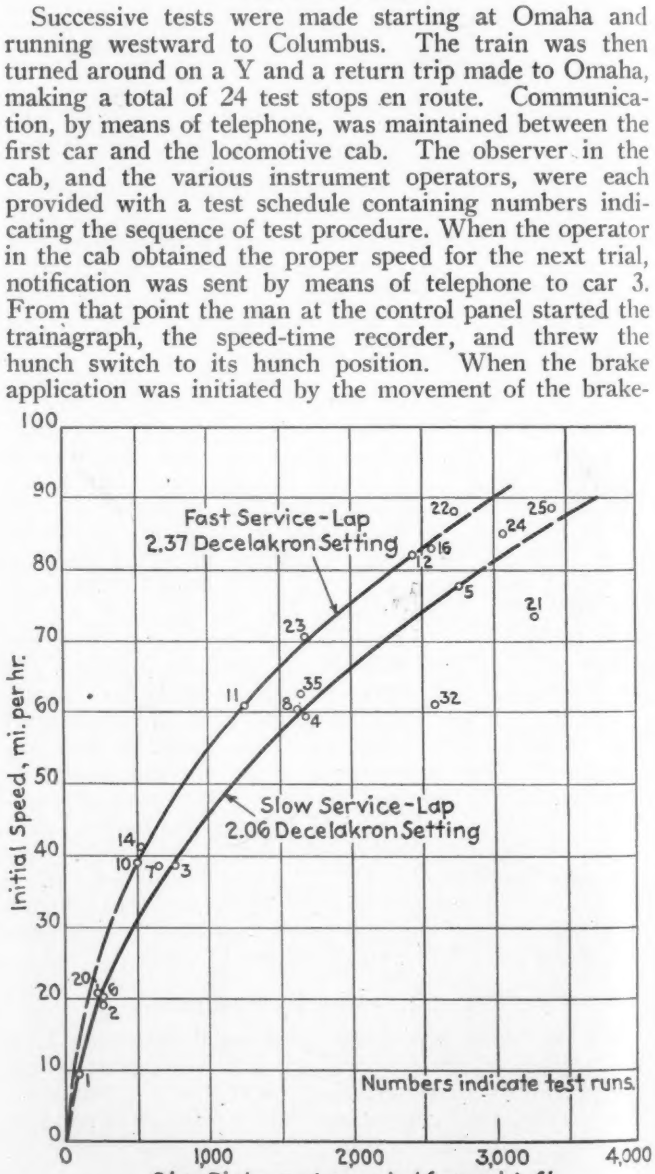
Actual weight includes test equipment and supplies as follows:
500 lb. on truck No. 5.
1,500 lb. on truck No. 6.
1,000 lb. on truck No: 7.
Added load under test conditions:
50 men at 160 lb.—8,000 lb. distributed.
Test equipment—200 lb. on truck No. 13.
Buffet supplies—300 lb. on truck No. 14.
Brake cylinders:
Four 10-in. by 8-in. cylinders on trucks Nos. 1 to 13, inclusive.
Four 7-in. by 8-in. cylinders on truck No. 14.

The deceleration recorder, located in the baggage compartment of car 3, was of the slidometer type calibrated to record retardation in miles per hour per second. A Wimperis accelerometer with the dial indications modified to provide readings directly in miles per hour per second was also read during the stops.

An indicating portable contact-type pyrometer provided means for obtaining shoe and tire temperatures immediately following the stops. These readings were not taken after each stop, but were obtained after all of the stops from high speeds. On the westbound runs, the pyrometer contact point was placed directly against the wheel tread. The readings were taken on the rear right wheel and shoe trucks Nos. 4 and 5.

Test Procedure

Successive tests were made starting at Omaha and running westward to Columbus. The train was then turned around on a Y and a return trip made to Omaha, making a total of 24 test stops en route. Communication, by means of telephone, was maintained between the first car and the locomotive cab. The observer in the cab, and the various instrument operators, were each provided with a test schedule containing numbers indicating the sequence of test procedure. When the operator in the cab obtained the proper speed for the next trial, notification was sent by means of telephone to car 3. From that point the man at the control panel started the trainagraph, the speed-time recorder, and threw the hunch switch to its hunch position. When the brake application was initiated by the movement of the brake-valve handle, the hunch circuit was automatically broken at the point in brake-valve movement where straight-air pipe pressure started to develop. As soon as the hunch on the trainagraph in car 1 indicated that the brake application had been started, the hunch switch was thrown over to its "time" position. Test records were continued until the train came to a stop, at which time the hunch and time circuit was broken to provide a stop indication on all the records. The stopping time was



Stopping distances with A H S C brake equipment

Table II — Performance Data From Road Tests of A H S C Brake Equipment on the "City of San Francisco"

Test No.	Type of application*	Grade at stop, per cent	Initial speed, m. p. h.	Stop time, sec.	Stop distance, ft.	Stop distance corrected for grade, ft.	State of charge at beginning of test: Front car B. P.	Front car S. R.	Rear car B. P.	Retardation, m. p. h. per sec.: Max.	Min.	Brake cyl. pressure, lb.: Front Max.	Front At stop	Rear Max.	Rear At stop	Shoe temp., deg. F., on truck No.: 4 Rear	5 Rear	Notes
1	SS-L	-0.50	9.7	8.1	78.5	70	112.0	105.0	110.0	3.4	..	30.0	10	32.0	10.0	...	...	......
2	SS-L	-0.50	19.3	18.8	303.0	270	116.0	107.0	111.5	..	..	32.0	11	32.0	10.0	...	...	Note A
3	SS-L	-0.50	39.0	26.6	808.0	748	115.0	108.0	111.0	2.8	1.8	47.0	11	50.0	13.0	...	...	......
4	SS-L	-0.50	59.8	36.7	1750.0	1630	115.0	107.0	111.0	2.6	1.8	78.0	14	80.0	13.0	...	...	......
5	SS-L	0	77.7	43.8	2732.0	2732	112.5	109.5	109.0	2.2	1.6	87.5	..	91.0	22.0	370	280	......
6	SS-S	+0.10	20.0	13.0	249.0	254	115.0	106.0	110.5	4.5	2.8	41.0	20	43.0	25.0	...	...	Note B
7	SS-S	+0.07	38.2	17.2	623.0	630	116.0	110.0	113.0	7.0	4.8	72.0	15	75.0	17.0	...	...	Note C
22	FS-S	0	87.9	37.0	2716.0	2716	115.0	109.5	112.0	5.5	..	97.0	14	97.0	16.0	340	380	Note D
8	FS-S	+0.10	60.2	28.8	1597.0	1618	115.0	110.0	112.5	4.5	..	95.0	11	95.0	12.0	...	...	......
23	FS-L	+0.14	70.5	28.2	1650.0	1674	114.5	106.0	110.5	5.0	..	95.0	16	95.0	11.0	...	...	Note E
10	FS-L	0	38.9	15.6	500.0	500	111.5	100.0	106.0	4.4	3.8	84.0	14	79.0	17.0	...	...	......
24	SS-L	-0.14	84.9	43.3	3128.0	3070	115.0	109.0	111.5	3.5	2.0	95.0	11	95.0	11.0	250	220	Note F
14	FS-S	-0.10	40.9	15.8	535.0	530	114.5	106.0	110.5	..	3.5	93.0	22	93.0	40.0	...	...	......
25	SS-S	-0.15	88.5	43.7	3460.0	3390	112.0	104.5	108.0	7.0	3.9	92.0	21	94.5	22.0	360	285	......
11	FS-L	-0.11	61.0	26.4	1256.0	1241	114.0	102.0	109.0	4.0	2.8	91.0	10	92.0	17.5	...	...	......
18	SC-E	-0.10	60.7	23.7	1273.0	1260	113.0	104.0	109.0	6.0	4.8	90.0	28	92.0	40.0	...	...	......
20	TC-S	-0.10	20.3	10.6	236.0	227	98.0	90.0	93.0	7.0	..	50.0	21	52.0	26.0	...	...	......
21	TC-C	-0.14	73.4	46.4	3358.0	3275	108.0	96.0	102.0	7.0	..	55.0	30	56.0	35.0	...	...	......
12	FS-L	-0.18	82.6	36.2	2505.0	2463	113.0	105.0	109.0	5.0	..	94.0	21	94.0	22.0	...	...	......
16	FS-S	-0.05	83.1	36.5	2585.0	2570	115.0	110.0	111.0	7.0	..	94.0	50	95.0	40.0	...	...	......
32	AS-30	-0.13	61.3	44.2	2710.0	2635	106.0	94.5	100.0	6.5	..	85.0	32	54.0	54.0	...	...	Note G
35	AE	+0.24	61.4	28.6	1592.0	1642	90.0	87.0	89.0	..	..	53.0	53	54.0	54.0	240	250	Note H
							Standing tests — Made between running tests Nos. 16 and 32.											
K	AS-10	...	...	...	....	....	....	....	....	..	..	14.0	..	14.0	...	...	...	......
L	AS-40	...	...	...	....	....	....	....	....	..	..	30.0	..	55.0	...	...	...	......
M	AS-20	...	...	...	....	....	....	....	....	..	..	22.0	..	24.0	...	...	...	......
O	AE	...	...	...	....	....	....	....	....	..	..	48.0	..	52.5	...	...	...	......

Test Conditions:

Tests 1, 2, 3, 4, 5, 6, 7, 8, 22, and 23, inclusive were run westbound. The remainder were run eastbound.
Wind velocity was practically zero for all tests.
All stops were made over tangent track.
Original Decelakron setting: Low-pressure service—2 mi. per hr. per sec., wide open; high-pressure service—2.5 mi. per hr. per sec., wide open; and emergency—3 mi. per hr. per sec., wide open.

*Legend:

SS-L—Slow service, brake valve lapped at first Decelakron response.
SS-S—Slow service, brake valve continuously in service position.
FS-L—Fast service, brake valve lapped at first Decelakron response.
FS-S—Fast service, brake valve continuously in service position.
SC-E—Safety control emergency; straight air.
TC-S—Train control, exceeding speed limit.
TC-C—Train control, change in indication not acknowledged.
AS-30—Automatic service, application, 30-lb. reduction.
AE—Automatic emergency.

Notes:

A—Brake valve unintentionally moved to release for an instant when Decelakron operated, then back to lap.
B—Off scale with Buff at stop. Operator moved brake valve to lap for an instant.
C—After test No. 6, Decelakron setting was raised approximately 0.5 mi. per hr. per sec.
D—Off scale with Buff at stop.
E—After test No. 23, high-service setting screw turned in 1.25 turns to 2.37 m.p.h. per sec. in lap.
F—All temperatures on eastbound tests were taken from the tire; temperatures taken during the eastbound run were from the shoes.
G—Automatic electric operation cut out; safety control operative. Change-over to automatic position.
H—Safety control cut out.

also obtained by several observers by means of stop watches.

The stopping distances were not measured on the track except on four tests made over the two sections of measured track. One of the observers in the cab made a record of the initial speed as recorded on the train speedometer, the brake-valve manipulation, the general functioning of the Decelakron and the approximate location of the stop in regard to mile posts. Another observer acted to maintain communication between the test crew and the engineman.

Table III — Decelakron Settings for the Various Tests

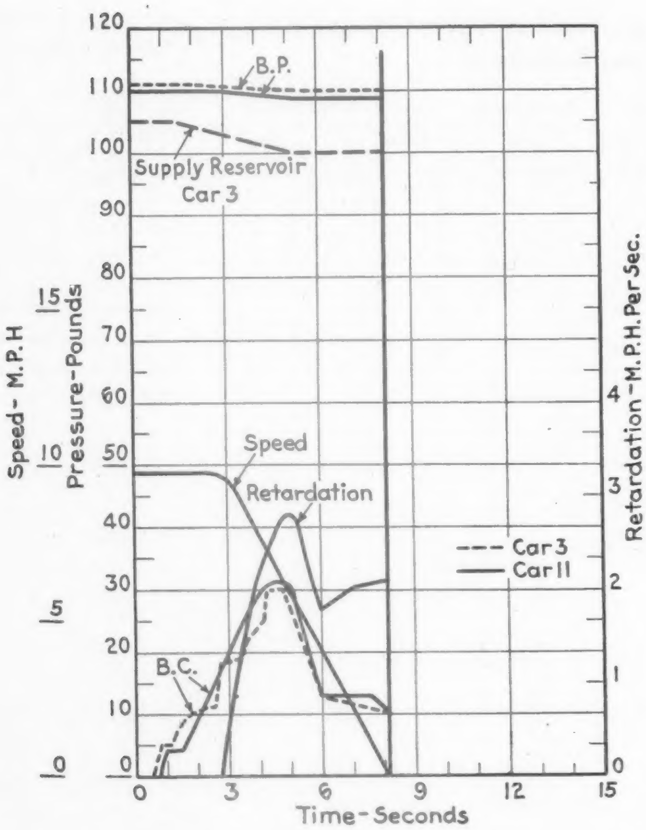
Test number and setting	Settings, m.p.h. per sec.: Full open: Low service	High service	Emergency	Lap: Low service	High service	Emergency
Initial setting, tests 1 to 6, inclusive	2.0	2.50	3.0	1.56	2.06	2.56
Second setting, tests, 7, 22, 8, and 23 ...	2.0	2.94	3.5	1.56	2.50	3.06
Third setting, tests 10 to 35, inclusive, in the order of test sequence	2.0	2.81	3.5	1.56	2.37	3.06

The Test Program

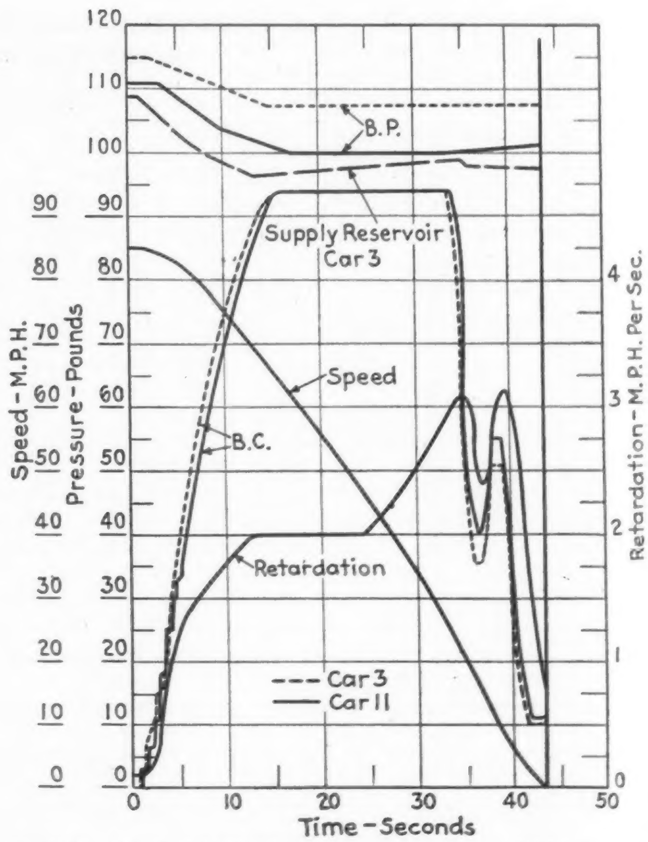
Some of the test instruments were applied to the cars before the train left the Pullman plant at Chicago. The remainder of the test equipment was installed at the Union Pacific car shops in Omaha, just prior to the tests. The instruments were checked to insure that records could be obtained which would be usable in working up the test data. It was impossible with the equipment at hand to provide for hunch and time on the tracer pulley-type speed-distance recorder located in car 11. Since this instrument had been installed merely as a check, the time and hunch were omitted during the tests and the speed records were taken from the instrument located in car 3. The instrument in car 11 was run during all of the tests and proved itself a reliable means of obtaining these data. A number of the records were worked up, assuming constant paper speed, and the results were comparable with those obtained on the spark coil machine in car 3.

Facilities did not avail themselves before the start of the test run for checking the 220-volt a. c. circuit which was used to drive the trainagraphs. This power was supplied by an auxiliary generator located on the train, and at the time the instruments were installed and checked the auxiliary engine could not be operated. This circuit, however, was checked at the start of the test run and, by means of putting the two trainagraphs in series, it was possible to operate the 110-volt motors successfully. The speed of these machines varied slightly, because of the change in frequency with auxiliary-engine speed, but, since the records contain a time indication, they could be worked up accurately.

The weight on each of the axles of the train had been determined by actual weighing at the Pullman plant. The leverage ratio between the brake cylinders and brake shoes was calculated from drawings furnished by the



Test No. 1—Straight-air slow-service stop from an initial speed of 9.7 m.p.h. with brake valve lapped at first Decelakron response—Stopping distance 78.5 ft.



Test No. 24—Straight-air slow-service stop from an initial speed of 84.9 m.p.h. with brake valve lapped at first Decelakron response—Stopping distance 3,128 ft.

Union Pacific. From these two sets of data, the braking ratio for each axle was determined. These values are shown in Table I. The braking ratio averaged 222.2 per cent for the power trucks and 250.3 per cent for the car trucks based on 110 lb. cylinder pressure. The overall braking ratio during the test run was 238.1 per cent.

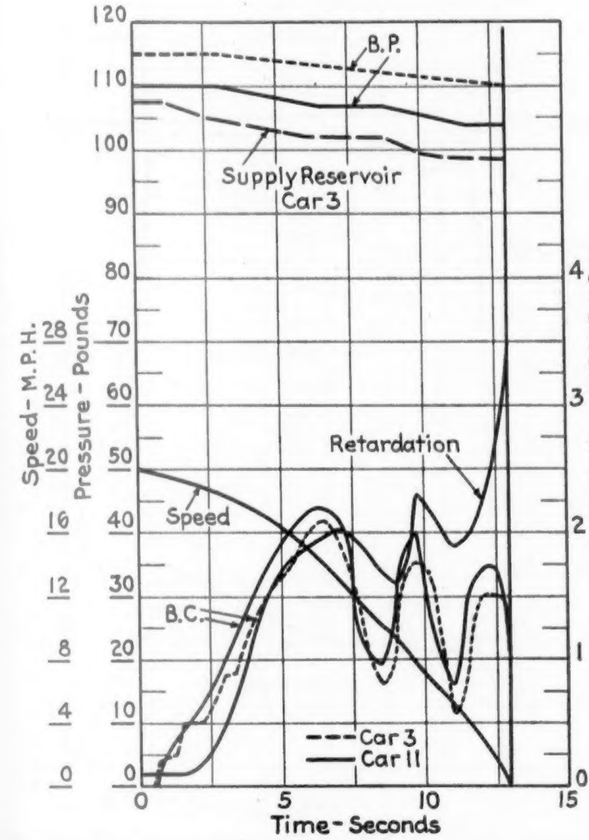
The operation of the pneumatic and electric equipment was checked as completely as time would permit. A check of the records showed straight-air and automatic operation to be as intended. It was impossible, however, to obtain all of the standing-test data which were required in the original test schedule. However, the piston travel was checked on all of the cars and a check was made to insure that effective applications were being received at the wheels before the test run was started.

The train left Omaha and ran westward as far as Columbus, Nebraska. During this run a total of 10 running tests were made. On the return trip 14 running and 5 standing tests were made. When the train reached Omaha, the test instruments were removed and the train was prepared for a run to San Francisco where it was started in revenue service.

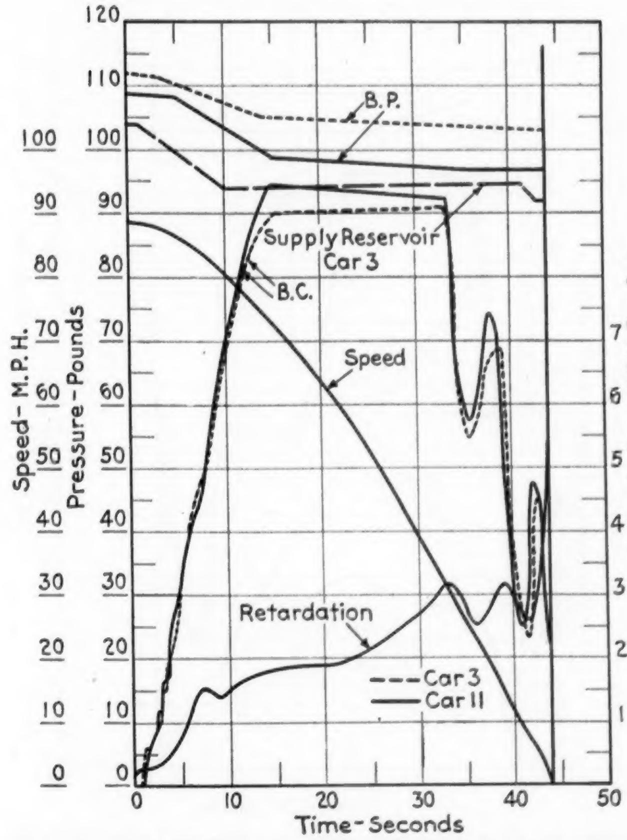
The first series of tests were slow service electro-pneumatic applications with the brake valve lapped when the Decelakron first operated. During this series of tests the Decelakron was set at 2 m.p.h. per sec. in low service (under 35 lb. brake-cylinder pressure); 2.5 m.p.h. per sec. in high service (over 35 lb. brake-cylinder pressure); and 3.0 m.p.h. per sec. in emergency. All of these rates were the values with the Decelakron wide open. No high rates of deceleration were apparent during this series and so the Decelakron setting was raised approximately 0.5 m.p.h. per sec. immediately following test No. 6. This setting resulted in too high rates of deceleration as evidenced by the fact that 95 lb. cylinder pressure was obtained on tests at 60 m.p.h. and over, in which cases venting did not occur until the speed had reduced to about 20 m.p.h. This venting was too late to prevent a rate of deceleration near the end of the stop of about 4 m.p.h. per sec. The Decelakron was set slightly lower for the return trip from Columbus, and after the completion of the tests, was set back to the original value.

Low-service setting relates to the adjustment whereby minimum brake-cylinder pressure is retained at the end of the stop. This prevents complete dumping of brake-cylinder air by the Decelakron as the retardation rate continues to increase at very low speeds. The low-service setting was not changed throughout the tests. High-service setting relates to the Decelakron adjustment as it affects maximum retardation rate during a high-service stop. The high-service setting can be adjusted independently of the low-service and emergency settings. Emergency setting has the same significance as high-service setting except that it permits a somewhat higher maximum retardation, and this adjustment governs only in the case of an emergency brake application. It is also necessary to distinguish between lap and full-open maximum retardation rates as they are governed by the Decelakron setting. Under either condition of high-service or emergency, the difference between lap adjustment and full open is governed by the resistance of the spring which controls the movement of the Decelakron weight. In these particular tests, the initial resistance of the spring was such as to cause a retardation rate differential of 0.44 m.p.h. per sec., i.e., the high-service and emergency settings for the full-open position will show an increase of 0.44 m.p.h. per sec. over the corresponding settings in lap position. Unless otherwise specified, reference to any Decelakron setting indicates the adjustment in the wide-open position. For the exact Decelakron setting for each test see Table III.

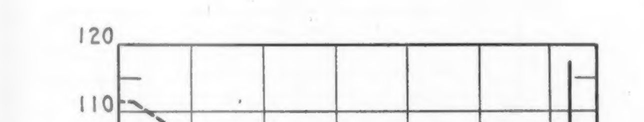
Four principal kinds of electro-pneumatic applica-



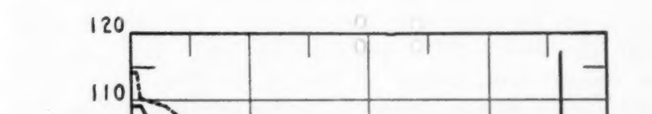
Test No. 6—Straight-air slow-service stop from an initial speed of 20 m.p.h. with brake valve continuously in service position—Stopping distance 249 ft.



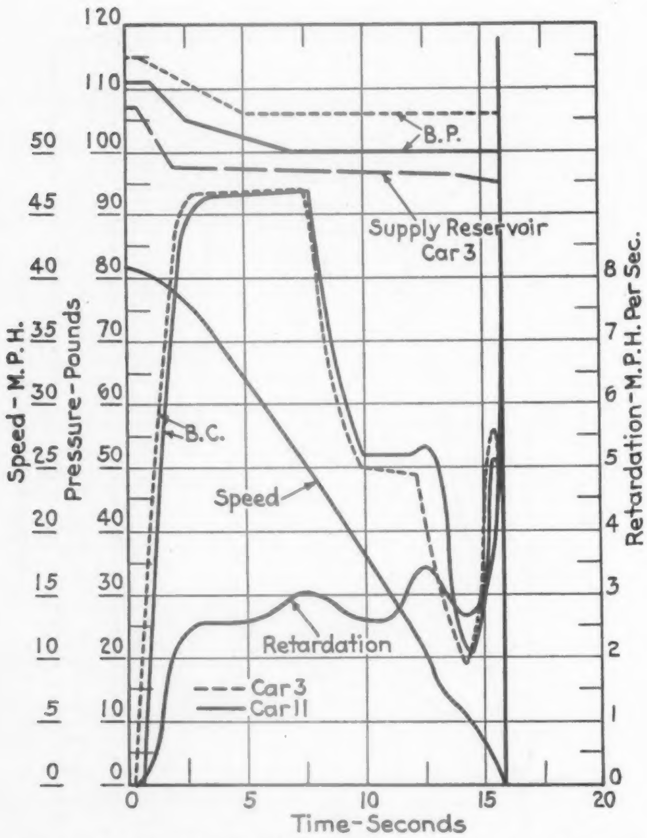
Test No. 25—Straight-air slow-service stop from an initial speed of 88.5 m.p.h. with brake valve continuously in service position—Stopping distance 3,460 ft.



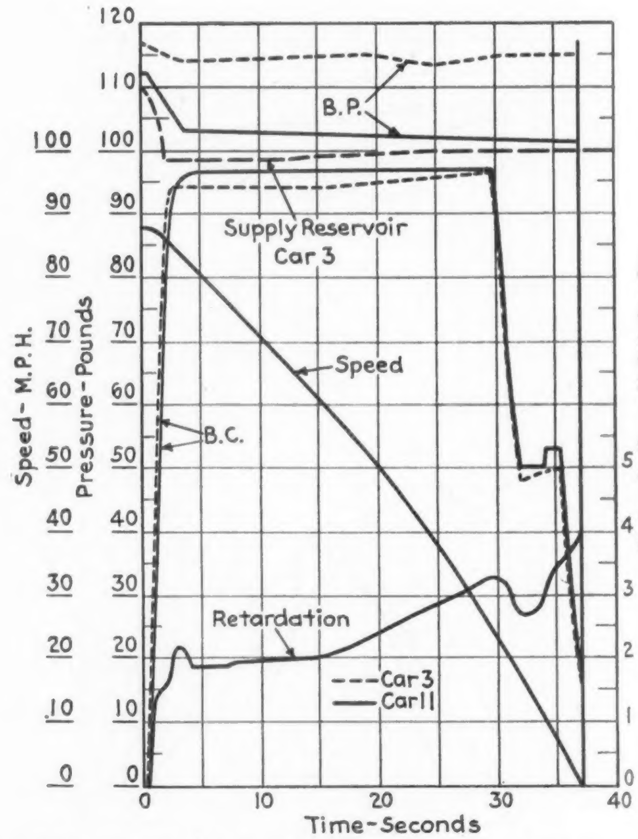
Test No. 10—Straight-air fast-service stop from an initial speed of 38.9 m.p.h. with brake valve lapped at first Decelakron response—Stopping distance 500 ft.



Test No. 12—Straight-air fast-service stop from an initial speed of 82.6 m.p.h. with brake valve lapped at first Decelakron response—Stopping distance 2,505 ft.



Test No. 14—Straight-air fast-service stop from an initial speed of 40.9 m.p.h. with brake valve continuously in service position—Stopping distance 535 ft.



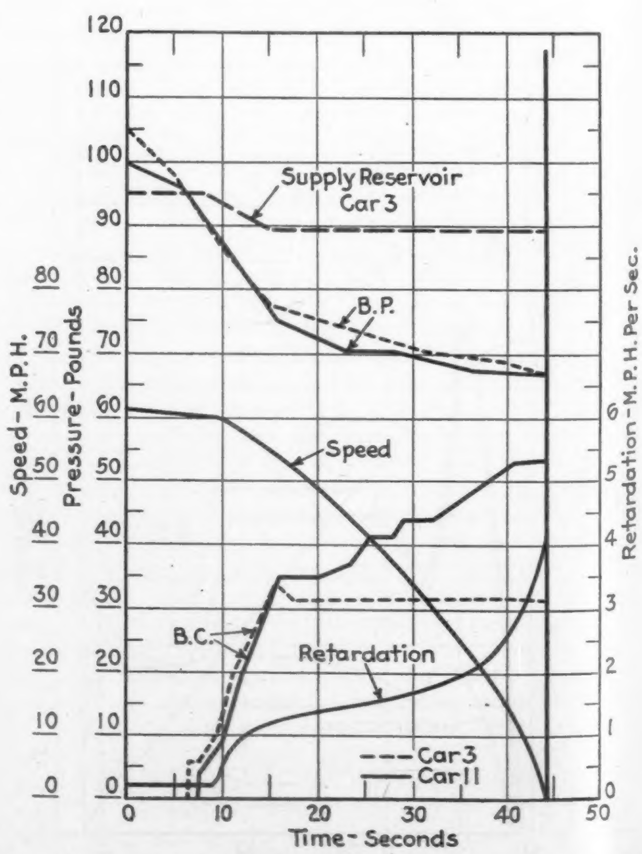
Test No. 22—Straight-air fast-service stop from an initial speed of 87.8 m.p.h. with brake valve continuously in service position—Stopping distance 2,716 ft.

tions were used in the tests. The first consisted of slow service applications with the brake valve returned to lap when the Decelakron first responded. The second series was also slow service, but with the brake valve allowed to remain continuously in service position. The third and fourth series consisted of fast service applications with the brake valve lapped on Decelakron response, and also with the brake valve remaining continuously in service position. These tests were made in the order shown in Table II.

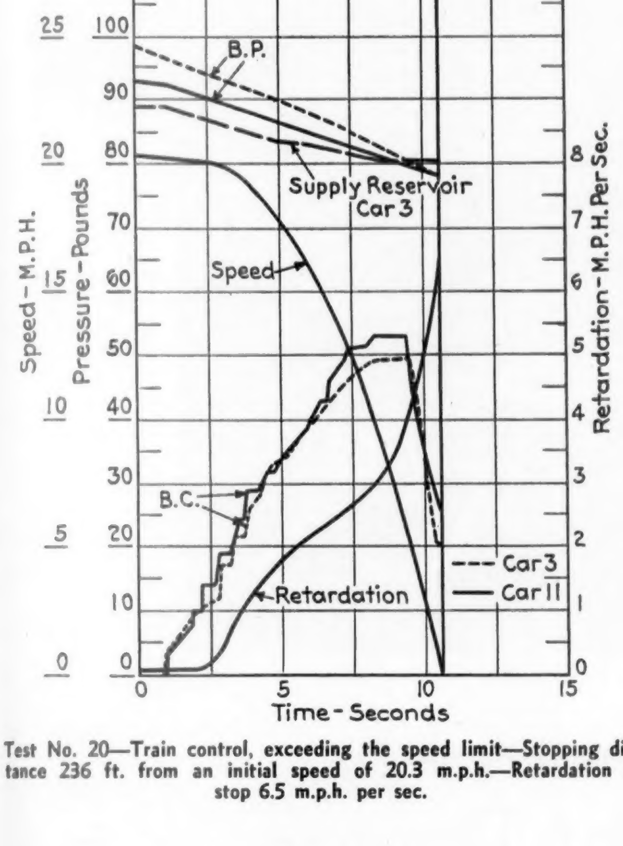
The equipment was changed over to automatic setting for running tests Nos. 32, 35 and 39. The feed-valve pressure was reduced to 90 lb. for all of the automatic tests. One of these tests was a full service application from 61 m.p.h. in which the stop distance was 2,710 ft. Another was automatic emergency application from 61 m.p.h. which resulted in a stop distance of 1,592 ft. The third test, No. 39, was made to demonstrate running releases and applications and is not reported in detail inasmuch as it was impossible to comply with the selected program for this test, and the test was completed over track of varying grade and curvature.

In order to demonstrate the effectiveness of train control, two applications were made, one by exceeding the speed limit and one by failing to acknowledge a change in indication. During these tests the equipment worked as intended, but the retardation rate near the end of the stop was as high as 6.5 m.p.h. per sec. During these train-control applications the hunch on the brake valve was broken manually at the proper time. This manual hunch was necessary because the brake-valve handle was left in release position, at least for the major part of the stop time, in order to simulate a condition when the engineman was incapable of proper response. The operation on these tests was considered satisfactory.

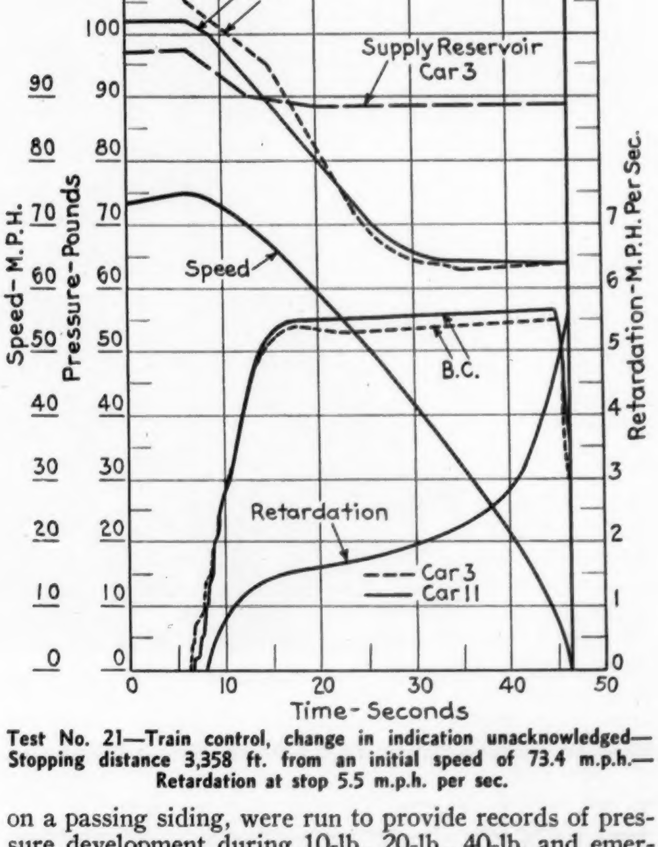
Five standing tests, made while the train was waiting



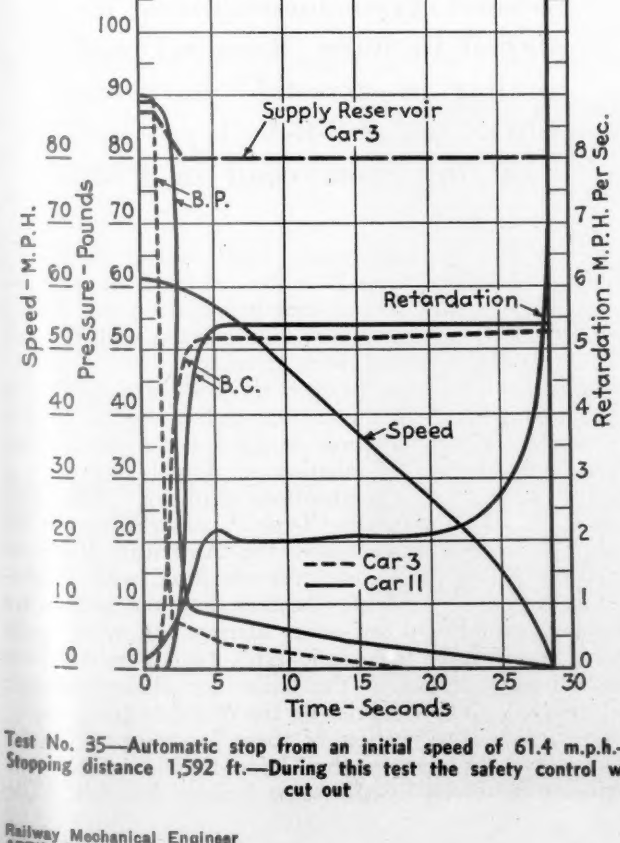
Test No. 32—Automatic service stop from an initial speed of 61.3 m.p.h. During this test automatic electric operation was cut out but the safety control was operative; change-over to automatic—Stopping distance 2,710 ft.



Test No. 20—Train control, exceeding the speed limit—Stopping distance 236 ft. from an initial speed of 20.3 m.p.h.—Retardation at stop 6.5 m.p.h. per sec.



Test No. 21—Train control, change in indication unacknowledged—Stopping distance 3,358 ft. from an initial speed of 73.4 m.p.h.—Retardation at stop 5.5 m.p.h. per sec.



Test No. 35—Automatic stop from an initial speed of 61.4 m.p.h.—Stopping distance 1,592 ft.—During this test the safety control was cut out

on a passing siding, were run to provide records of pressure development during 10-lb., 20-lb., 40-lb. and emergency reductions. The equipment functioned as intended during all of these tests. The general results obtained on the tests are shown in Table II.

Discussion of Test Results

Stopping Distance—No complete series of tests were made under any one condition of brake-valve manipulation and Decelakron setting. For this reason it was impossible to draw accurate conclusions as to relative stopping distances obtained under each of the conditions of tests. There were only two series of tests which contained more than two similar tests. One series consisted of slow service applications with the brake valve lapped at Decelakron response, which included five tests under the same conditions. Another series consisted of fast service applications with the brake valve lapped at the Decelakron response, which included four tests under the same conditions. However, these two series were made with different Decelakron settings which are given in Table III, and therefore are not directly comparable. The stopping distances for these two series are plotted as curves in one on the graphs. The other points under different conditions are plotted on this curve sheet as points only. This graph shows the test numbers for each of the points and the conditions of each test can be readily obtained from the legend in Table II. The stops were about 15 per cent longer in slow service than in fast service, but were practically the same irrespective of whether the brake valve was lapped or remained in service throughout the stop. The stopping distance was about 7 per cent shorter with the 2.37 Decelakron setting than with the 2.06 setting. The stopping distance for the automatic full service reduction was 54 per cent longer than the slow straight-air service stop at the same speed.

(*Continued on page 168*)

Front end of the Northern Pacific 4-6-6-4 type locomotives.

Boiler Dimensions and Grate Area Feature Northern Pacific

High-Speed Freight Power

Single expansion articulated 4-6-6-4 type locomotives designed to burn Rosebud coal similar in general characteristics to 2-8-8-4 type first built for same road in 1928

The Northern Pacific recently placed in service twelve 4-6-6-4 type articulated locomotives for use in high-speed freight service. These locomotives were built by the American Locomotive Company and while of somewhat smaller capacity than an order of 2-8-8-4 locomotives, the first of which was built in 1928* are in many respects similar to the earlier ones, particularly in relation to total weight, general boiler dimensions and grate area. The fire boxes of these 4-6-6-4 type locomotives are designed to burn Rosebud coal on grates of unusual size. The steam-pipe connections to the front and rear cylinders are similar to the larger locomotives previously mentioned.

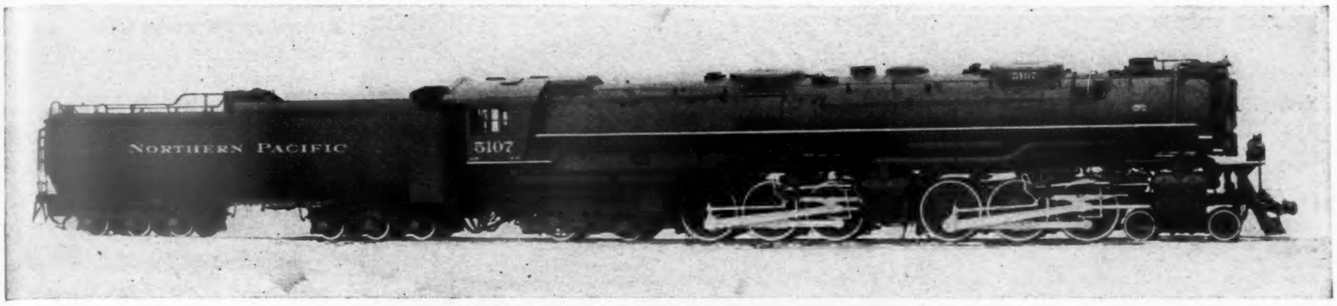
The boiler of the 4-6-6-4 locomotive is of the straight-top radial-stay type and carries a working pressure of 250 lb. The cylindrical courses of the boiler and the top section of the firebox wrapper sheet are of silicon manganese steel. The fireboxes and the side sections of the wrapper sheet are Lukens carbon steel. The firebox is 246⅛ in. long by 114¼ in. wide and a combustion chamber extends 89 in. forward in the barrel of the boiler. The grates are 192 in. long; the remaining 54 in. at the front end of the firebox is separated from the grates by a Gaines wall and sealed to form additional combustion space. The arch is supported on three Nicholson Thermic Syphons, the necks of which are 8 in. in diameter. The grates are of the Northern Pacific rocking pin-hole type developed to burn the Rosebud coal which is high both in moisture and in ash and of relatively low heating value. The coal is fired by a Standard modified Type B stoker, which is of the same general design and size as that installed on the 2-8-8-4 type locomotives. The smokebox is fitted with the railway's standard Cyclone spark arrester.

Flannery type MX flexible staybolts are applied in the breaking zones in the corners and along the tops of the side sheets, and in three of the lower rows of radial stays. A complete installation of flexible staybolts is applied around the combustion chamber. The tube sheets are laid out for the Type A superheater, in the header of which is included the American front-end throttle. All of the locomotives are fitted with Worthington No. 6SA feedwater heaters, and the boilers are equipped with Barco low-water alarms. Blow-off cocks are of the Wilson pneumatic type, two of which have connections to pipes in the boiler for sludge removal and discharge into a muffler on top of the boiler.

The frame construction of these locomotives follows closely that employed on the Union Pacific 4-6-6-4 type engines † delivered by the same builder last fall. The

* For a description of these locomotives, see the *Railway Age* for December 29, 1928, page 1295.

† For a description of these locomotives see the *Railway Age*, December 19, 1936, page 900.



The Northern Pacific high-speed freight locomotive

cast-steel cylinders of the earlier locomotives, however, are of three-piece construction, while those on the Northern Pacific are of two-piece construction and are so designed that all four cylinder castings are interchangeable.

The frames are cast-steel of the bar type, the rear unit being bolted at the back end to the cradle casting and at the front to the cylinders and articulation hinge casting. The bracing of the rear frames is of conventional arrangement.

On the front engine, which has no rigid connection to the boiler, the frames are braced by a series of trunk castings of box section. The first of these extends from the bumper back under the cylinders and terminates just ahead of the front pedestal. It carries the brake cylinders. The intermediate section extends back past the second pedestals and supports the centering device and valve-gear castings. The rear section includes the back pedestal and the articulation hinge assembly as well as the front-engine stabilizing device. All these trunk castings are securely bolted together and attached to the frames by flanges which are securely bolted to the front and back legs of all pedestals. They thus form a continuous torsion-resisting support from the front to the rear end of this unit.

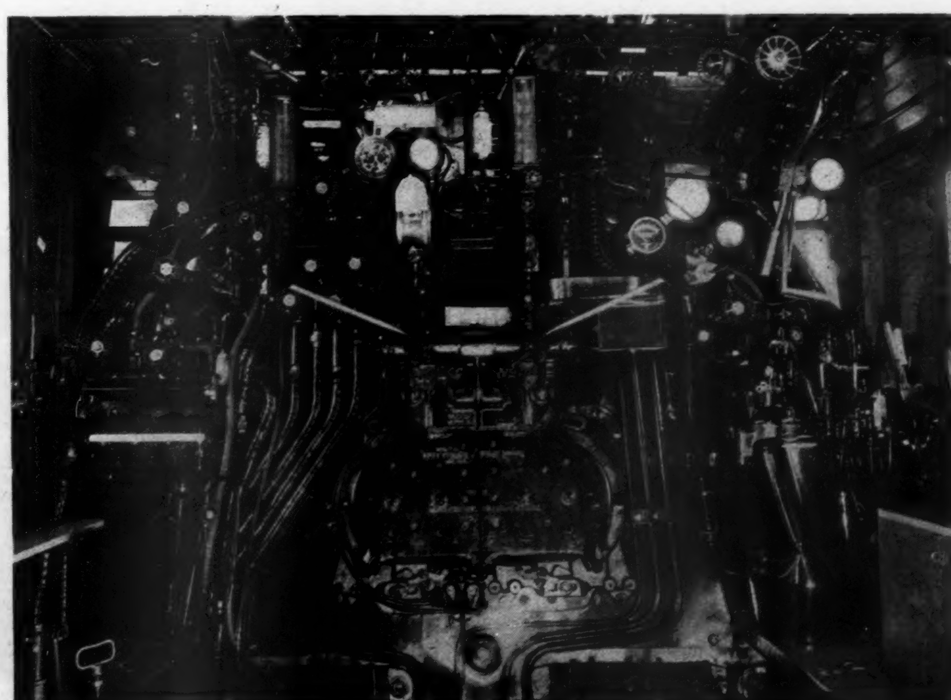
Comparison of the General Dimensions of the Northern Pacific 4-6-6-4 and 2-8-8-4 Type Freight Locomotives

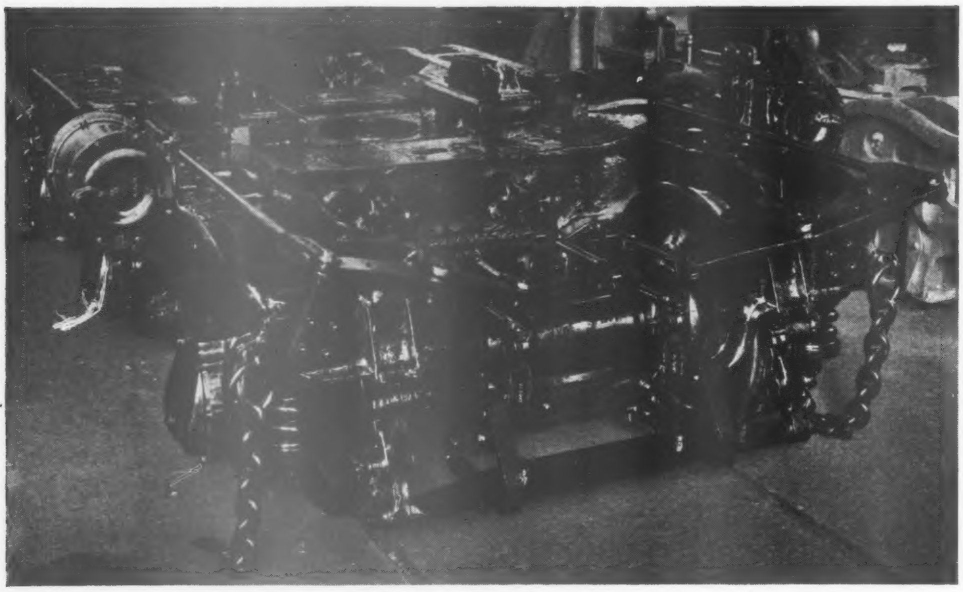
	4-6-6-4	2-8-8-4
Builder	American	American
Year built	1936	1928
Rated tractive force, lb.	104,500	139,900
Booster tractive force, lb.	......	13,400
Total tractive force, lb.	104,500	153,300
Weight on drivers, lb.	435,000	554,000
Total engine weight, lb.	624,500	715,000
Total engine and tender weight, lb.	1,023,000	1,116,000
Cylinders — number, and diameter and stroke, in.	4—23 x 32	4—26 x 32
Boiler pressure, lb.	250	250
Grate area, sq. ft.	152.3	182
Total evaporative heating surface, sq. ft.	5,832	7,673
Superheating surface, sq. ft.	2,114 (Type A)	3,219 (Type E)

The boiler is supported at one point on the front frame system and the stabilizing device, which is similar to that applied on the Union Pacific locomotives previously referred to, tends to prevent synchronous rocking oscillations of the front frame system about the boiler support as a pivot. This is a friction device, the movable element in which is attached to a crank arm on the horizontally pivoted hinge casting at the rear end of the unit. Further resistance to the setting up of synchronous vertical rocking of the front frame system is provided by a snubbing device in the engine truck of the same type as that employed on the Union Pacific locomotives.

The six-coupled driving wheels in each unit are of the builder's Boxpok type. The driving axles on eight of the locomotives are fitted with Timken roller bearings mounted in two-piece housings. On four of the locomotives the driving axles are fitted with crown-bearing boxes and Franklin grease cellars. The main boxes are of the Grisco type. The pedestals on these locomotives are fitted with Franklin adjustable wedges. The

Arrangement of piping on the boiler back head





Commonwealth six-wheel equalized tender truck equipped with Timken roller bearings and Simplex unit-cylinder clasp brakes

front pair of driving wheels in each unit is fitted with the Alco lateral cushioning device.

The locomotives are fitted with Alco lateral resistance trucks of the geared roller type. These are designed to produce a low initial resistance, building up to a higher constant resistance after about 1 in. movement. A vertical damping device with rotating friction plates designed by the builder is incorporated in these trucks. The trailing truck is of the Commonwealth four-wheel Delta type. The centering device in these trucks is arranged with a low initial resistance, building up to a higher constant resistance after a small movement, similar in function to that on the engine trucks. The axles of both trucks are fitted with Timken roller bearings; those on the inside journals of the engine truck are of the single-housing type. The front axle of the trailing truck is also equipped with the Timken lateral motion device. The engine truck and the front axle of the trailing truck have Bethlehem heat-treated wrought-steel wheels, as do the tender trucks also. The rear trailing-truck wheels are cast-steel centers with steel tires.

Looking inside the firebox

The main and side rods are of carbon steel, fitted with floating bushings on the main pins and solid bushings on the front and back pins. The main crank pins are of low-carbon nickel steel and the others of carbon steel.

Solid Z-section piston heads of electric cast steel are employed. These are fitted with the Locomotive Finished Material Company's bronze packing rings. The piston rods are of carbon steel and the crossheads of Univan cast steel, fitted in guides of the multi-bearing

Commonwealth four-wheel trailer truck equipped with Timken roller bearings

type. The crosshead bearing surfaces are lined with blocked tin. The piston rods and valve stems are fitted with U. S. metallic packing and Viloco lubricators are applied to the piston rods. The cylinder bushings, valve bushings, valve packing and bull rings are of Hunt-Spiller gun iron.

General Dimensions, Weights and Proportions of the Northern Pacific 4-6-6-4 Type Locomotives

Railroad	Northern Pacific
Builder	American Locomotive Company
Type of locomotive	4-6-6-4
Road class	Z-6
Road numbers	5100-5111
Date built	1936
Service	Freight
Dimensions:	
Height to top of stack, ft. and in.	16–11½
Height to center of boiler, ft. and in.	11– 0
Width overall, ft. and in.	12– ⅛
Cylinder centers, both engines, in.	91
Weights in working order, lb.:	
On drivers	435,000
On front truck	73,000
On trailing truck	116.500
Total engine	624,500
Tender	398,500
Wheel bases, ft. and in.:	
Driving	35– 1
Rigid	12– 2
Engine, total	61–10
Engine and tender, total	113– 8
Wheels, diameter outside tires, in.:	
Driving	69
Front truck	33
Trailing truck	37 front 45¾ back
Engine:	
Cylinders, number, diameter and stroke, in.	4 – 23 × 32
Valve gear, type	Walschaert
Valves, piston type, size, in.	12
Maximum travel, in.	7½
Steam lap, in.	1 9/32
Exhaust clearance, in.	⅜
Lead, in.	5/16
Cut-off in full gear, per cent	84.7
Boiler:	
Type	Straight-top
Steam pressure, lb. per sq. in.	250
Diameter, first ring, inside, in.	96⅜
Diameter, largest, outside, in.	102
Firebox, length, in.	246–⅛
Firebox, width, in.	114¼
Height mud ring to crown sheet, back, in.	78⅞
Height mud ring to crown sheet, front, in.	90
Combustion chamber length, in.	89
Thermic syphons, number	3
Tubes, number and diameter, in.	192–2¼
Flues, number and diameter, in.	73–5½
Length over tube sheets, ft. and in.	23–0
Fuel	Rosebud coal
Grate type	U. P. round-hole table
Grate area, sq. ft.	152.3
Heating surfaces, sq. ft.:	
Firebox and comb. chamber	626
Thermic syphons	213
Firebox, total	839
Tubes and flues	4,993
Evaporative, total	5,832
Superheater (Type A)	2,114
Combined evap. and superheat.	7,946
Feedwater heater, type	Worthington 6Sa
Tender:	
Style	Semi-Vanderbilt
Water capacity, gal.	20,000
Fuel capacity, tons	27
Trucks	Six-wheel
Journals, dia.	6.754 (roller bearings)
General data, estimated:	
Rated tractive force, engine, lb.	104,500
Weight proportions:	
Weight on drivers ÷ weight engine, per cent	69.8
Weight on drivers ÷ tractive force	4.17
Weight of engine ÷ comb. heat. surface	78.8
Boiler proportions:	
Firebox heat. surface, per cent combined heat. surface	10.5
Tube-flue heat. surface, per cent combined heat. surface	63.0
Superheat. surface, per cent combined heat. surface	26.6
Firebox heat. surface ÷ grate area	5.5
Tube-flue heat. surface ÷ grate area	32.8
Superheat. surface ÷ grate area	13.8
Combined heat. surface ÷ grate area	52.0
Tractive force ÷ grate area	685.0
Tractive force ÷ combined heat. surface	13.2
Tractive force × dia. drivers ÷ combined heat. surface	907.5

The valve motion on these locomotives is of the Walschaert type arranged so that the link blocks on both front and back units are in the lower portion of the link in the go-ahead position. The reverse gear is the Alco Type G.

Each locomotive is fitted with one Detroit hydrostatic lubricator, which furnishes oil for the stoker and air compressors, and four force-feed lubricators. Two of these are Detroit six-feed, 32-pint, located on the front engine with feeds to cylinders, valves and guides. The other two are King 30-pint lubricators, one a six-feed and one a seven-feed, located on the rear engine with feeds to cylinders, valves, guides, steam-pipe joints and hinge pins.

The two 8½-in. cross-compound air compressors and the hot-water pump are mounted on the smokebox front, which is of cast steel with the brackets for the pump and strap portion of the Okadee hinge cast integral. Two sandboxes of large capacity are applied on top of the boiler. The running boards are Safkar type plates. The air-brake equipment is Westinghouse No. 8-ET.

The tender tank is of the semi-Vanderbilt type with a coal capacity of 27 tons and a water capacity of 20,000 gallons. The tender frame is of the General Steel Casting water-bottom type, and the tank is of welded construction throughout. The coal space is fitted with a Standard Stoker coal pusher.

The tender trucks are of General six-wheel equalized type and are fitted with Timken roller bearings. The truck clasp brakes are of the Simplex unit-cylinder type.

The principal dimensions and data are shown in one of the tables.

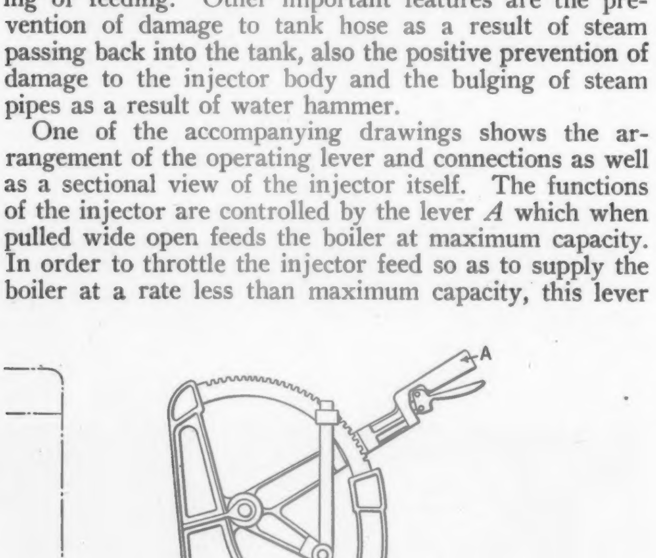
* * *

Interior of one of 12 passenger cars under construction at the Newport shops of the Victorian Railways of Australia. The truck frames, truck bolsters, center sills, side sills, roofs, and side sheets are all of light-weight design incorporating U.S.S. Cor-Ten Steel. All the floor sheets are of 20-gage plug-welded corrugated material welded to 5/32-in. floor longitudinals. The cars are for one of the Victorian Interstate express trains

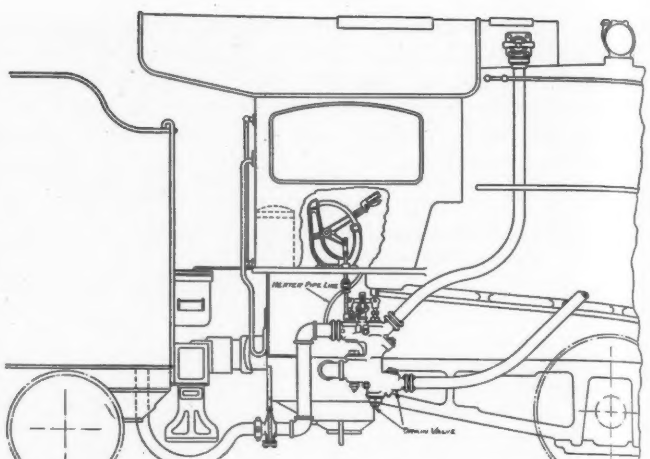
Injector Operated By Single Control

Complete control by means of a single operating lever is perhaps the outstanding feature of the Type S injector recently developed by William Sellers & Company, Inc., 1600 Hamilton Street, Philadelphia, Pa. This injector is so designed that the several functions such as opening the water valve, opening the steam valve and closing the overflow are performed by means of a single control. The Type S injector is of the combined lifting and non-lifting type so that it may be located high enough above the rail to eliminate the possibility of damage from the roadway and yet drain the water from the lowest point in the tank. One of the features of this injector is that of quick starting, there being embodied in the design a self-closing overflow which eliminates loss of water along a roadway when the injector is starting or feeding. Other important features are the prevention of damage to tank hose as a result of steam passing back into the tank, also the positive prevention of damage to the injector body and the bulging of steam pipes as a result of water hammer.

One of the accompanying drawings shows the arrangement of the operating lever and connections as well as a sectional view of the injector itself. The functions of the injector are controlled by the lever *A* which when pulled wide open feeds the boiler at maximum capacity. In order to throttle the injector feed so as to supply the boiler at a rate less than maximum capacity, this lever is moved forward to the desired position. The movement of the lever *A* to the extreme forward or down position completely stops the feeding. When the lever *A* is pulled back toward the operator the rod *B* moves upward causing the lever *C* to rotate on its fulcrum pin *H*. This movement in turn pushes upward the two links *D* and the yoke *E*. The upward movement of this yoke *E* is however not in a straight line but fulcrums on the pin *J* so that the pin *K* describes a partial arc and raises the spindle *F*. The steam valve, which is attached to the lower end of the spindle *G*, is held on its seat by the full boiler pressure whereas the water valve, attached to the spindle *F*, is subjected only to the downward pressure of the water in the tank. As the spindle *F* reaches its maximum upward stroke and the water valve stops against its stuffing box any further movement of the lever *A* causes the yoke *E* to fulcrum about the pin *K* and raises the spindle *G* and the attached steam valve from its seat. When the steam valve reaches its maximum opening the jet within the injector tubes is completely formed and as it reaches a velocity sufficient to overcome boiler pressure it raises the line check valve *L* from its seat. When this line check valve moves upward it lifts a small pilot valve attached to it from its seat thereby admitting pressure through a port to a chamber above the overflow valve *M* exerting a downward pressure on the latter locking it to its seat.



Arrangement of the operating lever and connections and a sectional view of the Type S injector



A typical installation of the Type S injector. Its location is not limited by the height of the tender bottom

In order to throttle the injector feed to suit the evaporation of the boiler the lever *A* is moved partly forward causing a downward movement of the rod *B*, the lever *C*, the link *D*, the yoke *E* and then fulcrums on the pin *J*. The movement of the latter is reversed from that which occurred on the opening movement, the boiler pressure being under the steam valve attached to the spindle *G* so that the steam valve cannot move downward to its seat until the water valve attached to spindle *F* is first seated. Further upward movement of the lever *A* serves to seat both the water and the steam valves. Boiler pressure then closes the line check *L* and the pilot valve, the pressure then being permitted to exhaust from the chamber above the overflow valve which opens and permits any excess water to drain from the injector casing.

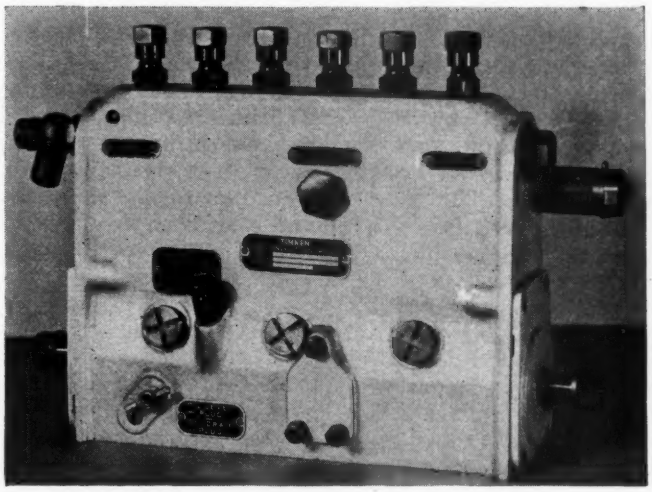
The Type S injector is made in three sizes, the Type SL being designed for the delivery of 4,900 to 5,800 gal. per hour; the Type SR for 6,500 to 7,500 gal. per hour and the Type SW for capacities of 8,000 to 12,000 gal. per hour. The Type X injector is similar in general construction to the Type S but is designed for operation at boiler pressures up to 350 lb.

Timken Fuel-Injection Pump For Diesel Engines

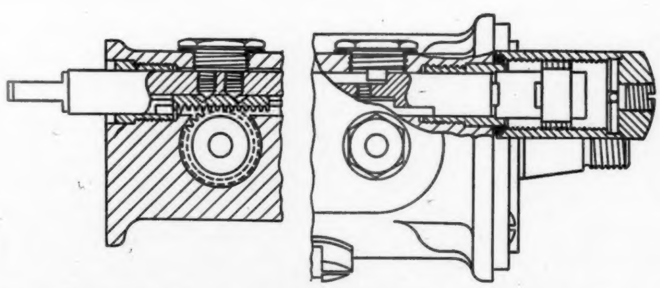
To meet the demand for a dependable high-speed solid-injection fuel pump for Diesel engines, The Timken Roller Bearing Company has developed two sizes of multiple-unit, integral-cam-shaft pumps, one using a 4 to 9 mm. range of plunger sizes and the second a 5 to 11 mm. range. At present these pumps are being made for one-, two- and six-cylinder engines. These fuel pumps are the result of three years of laboratory development plus a full year of testing in the field on commercially-operated Diesel trucks, buses and tractors.

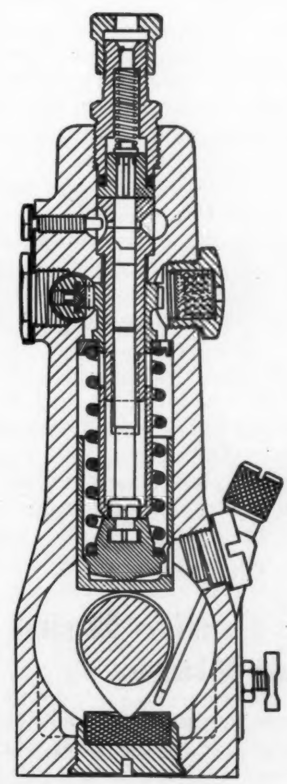
As will be seen from the accompanying diagrams, these pumps are of the cam-operated helical-plunger type, the metering being adjusted at the factory and sealed. At the lowest position of the plunger the cylinder receives a charge of oil from the feed line, which is kept filled by a special feed pump connected to the fuel tank. Delivery of the fuel to the engine starts as soon as the piston covers the inlet port and ends when the upper helical edge of the annular groove in the piston opens the overflow or by-pass port on the opposite side of the pump cylinder wall, releasing the pressure to the discharge line. The effective delivery stroke of the piston may be regulated by turning the piston in its cylinder or barrel to vary the point of the delivery stroke in which the overflow port is uncovered.

An outstanding feature of these Timken pumps is that they are driven by constant velocity cams. Thus the delivery speed of the fuel entering the combustion chamber of the engine is maintained constant at a speed adapted to the rate of combustion, thereby increasing the engine efficiency and fuel economy. The deceleration portion of the motion comes late in the stroke, thus permitting the use of a lighter spring and reducing the spring load between the tappet and the cam.



Exterior of Timken fuel injection pump for six-cylinder Diesel engine





The three views in this drawing show, from right to left, a vertical section through the pump, a horizontal section through the rack stop and a horizontal section through the rack

For adjusting the pistons to vary the amount of fuel delivered, a simple and positive method has been devised. This comprises a rack rod which extends horizontally along the rear face of the pump, meshing with precision cut gears on the upper ends of the driving sleeves. The upper or driving sleeve for each piston may thus be rotated on the barrel of the pump. This upper sleeve is tongue and groove connected with the lower sleeve, which fits on the piston. As the upper sleeve is rotated on the barrel, the lower sleeve rotates the piston, thereby changing the position of the helix with respect to the relief port.

Surrounding these sleeves are light helical springs that serve to retract the pistons and hold the driving sleeves in position. The tappet cup is so designed as to provide a minimum of wearing surface between the cam and the pump plunger and is made of a new type graphitic steel recently developed by the Steel and Tube Division of the Timken Roller Bearing Company. This steel, which contains free graphite, can be heat treated to provide the extremely hard wear-resisting surface desired and the graphite acts as a lubricant retainer in the polished surface, thereby assuring positive lubrication at all times and long accurate life under the severe lubrication conditions which exist in every Diesel injection pump.

The tappet and spring design is such as to eliminate the need for an adjusting screw between the plunger and the spring, the tappet cup adjustment depending upon the accuracy of the parts. This is not subject to field adjustment and is made in the factory to precision standards. Riding as it does on the cam, the tappet spins, holding wear to a minimum. Likewise its use reduces the number of parts between the cam and the plunger and permits the installation of a safer spring which is

not subject to breakage at annoyingly frequent intervals.

To adjust the individual metering sleeves on the plungers the rack rod is provided with a series of detachable rack sections which mesh with the gears of the metering or driving sleeves. These are adjusted longitudinally on the rack rod and locked in position by means of two horizontally spaced parallel screws with conical ends. The space between the two screws is less than the space between the conical recesses in the movable sections, thus enabling the sections to be moved in slight but definite and positive increments as the screws are tightened and loosened.

A special stop is provided in connection with the rack rod which controls the metering sleeves whereby the maximum amount of fuel delivered to the engine may be definitely limited. At one end of the rack a knurled nut controlling the stop is provided by means of which the maximum amount of fuel can be limited according to the altitude at which the engine is working. A series of cotter pin holes is drilled through this nut, the space between each hole representing the change required in adjustment for a thousand foot change in altitude.

The piston rotating mechanism has several notable advantages. The toothed rack sections may be quickly and easily removed and replaced when worn or damaged. They may also be adjusted independently of each other to obtain uniform angular adjustment of all pistons without removing the rack bar or dismantling the pump.

As these pumps must operate under pressures running as high as 10,000 lb. per sq. in. and the clearance between the plunger and the bore of the pump barrel is only .000030 in., it is essential that the housing be specially designed to provide the necessary stiffness, for even the slightest deflection would affect the accuracy of the unit. This has been done by the use of special alloy steels to assure the strength needed.

For convenience in installation and in line with American practice, Timken fuel injection pumps are all made to fit standard bases and all connecting parts conform to standard dimensions. Likewise all parts are made on the American production plan, being interchangeable and easily replaced when necessary directly from conveniently located stocks.

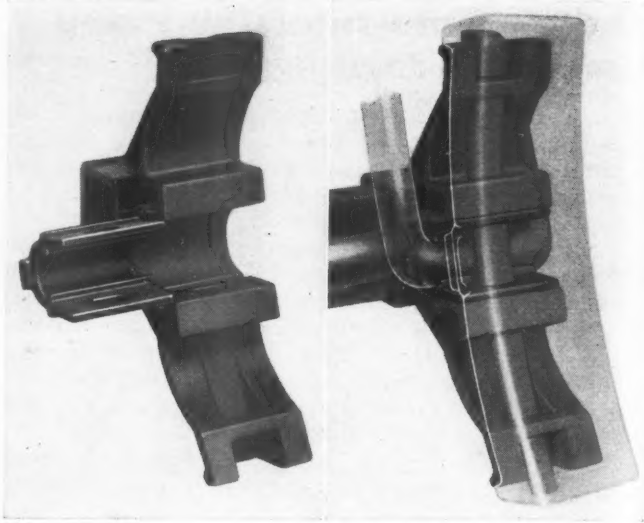
The Type A or small size pumps using a 4 to 9 mm. range of plungers is adapted for use on Dissel engines up to approximately 150 hp. and operates at speeds up to approximately 4,000 r.p.m. The Type B, using a 5 to 11 mm. range of plungers, is ordinarily used on engines from 110 to 250 hp., operating at speeds up to approximately 3,000 r.p.m.

Economy Brake Head And Wear Plate

Brake head wear is accentuated by modern high operating speeds, developing first on the shelf where the shoe lug bears and then on the hanger eye. It follows that toe wear develops as soon as the lower shelf is worn so that the shoe drops and cuts into the toes.

To meet this condition, the Illinois Railway Equipment Company, Chicago, has developed and is now marketing the Economy brake head and wear plate, in which a renewable wear-resisting drop-forged steel plate takes all shoe lug and hanger wear. Tapered splines on the top and bottom of the plate provide a tight press fit in the head. An extended lug on the plate bearing against the tension rod locks the plate in the head when the beam is assembled.

This construction is said to make the brake head last indefinitely and to meet A.A.R. specifications as an approved alternate standard. It assures reliable brake head performance at substantially reduced overall cost.



Drop-forged steel wear plate, before and after application in the Economy brake head

Light-Weight Nickel-Copper Steel Car Doors

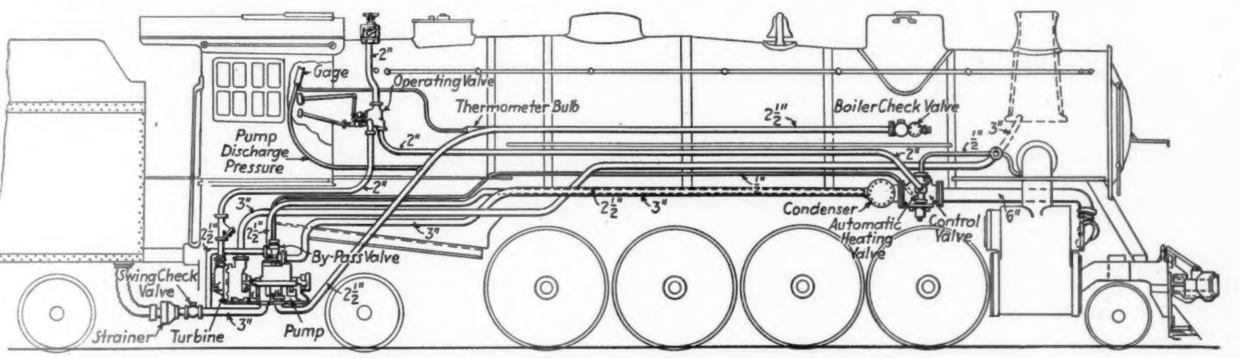
Difficulties previously encountered in cold-forming operations which called for deep drawing steel have been materially reduced in recent production of box-car doors by the Youngstown Steel Door Co., Youngstown, Ohio. This manufacturer reports that door panels having a three-way draw at the end of each corrugation involved less spring back than is usually encountered in the high-strength steels.

Yoley, high-ductility nickel-copper alloy steel produced by The Youngstown Sheet & Tube Co., was used in the operations. A reduction of 150 lb. per door from the normal weight of box-car doors of comparable-strength carbon steels was achieved. The fabricating company found that the tight hard scale present on sheets of this material does not crack in the forming of the sharper angles.

Box-car doors made by the Youngstown Steel Door Company—Each Yoloy door represents a saving in weight of 150 lb., or 300 lb. per car

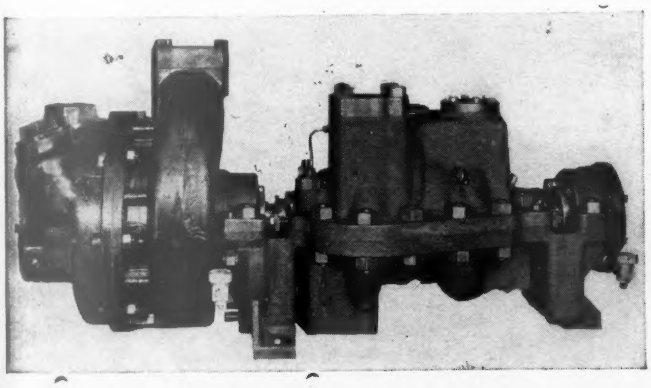
The Hancock Turbo-Injector

A Turbo-Injector system for supplying hot feedwater to locomotive boilers was described at the Western Railway Club feedwater-heating symposium on November 16, 1936, by W. J. Hall of the Consolidated Ashcroft Hancock Company, Inc., the company responsible for the development. The system consists of a four-stage centrifugal pump driven by a steam turbine, a condensing chamber, a combination check valve and control valve, an operating valve, a by-pass valve, and an automatic heating valve.



Installation of the Hancock Turbo-Injector on a locomotive

With this device hot water is fed to a locomotive boiler by pumping the cold water from the locomotive tender through the condensing chamber which contains several nozzles and tubes quite similar to the nozzles and tubes used in a live-steam injector and which, in this device, entrain and mix the exhaust steam with the cold water. Consequently, the Turbo-Injector may generally be classed as an open-type feedwater heater in which the exhaust steam mixes directly with the feedwater. The principle employed which is new to locomotive practice is the use of these nozzles and tubes for entraining exhaust steam from the exhaust passages and for mixing this steam with the water.



The turbine-driven pump unit on the Turbo-Injector system

The various parts of the system function as follows: The steam turbine, which drives the four-stage centrifugal pump, has three stages, is rated at 50 hp., is equipped with a governor and runs at a maximum speed of 5,000 r.p.m.

The pump has four stages which are hydraulically balanced to prevent end thrust. Both the pump and turbine rotors are mounted on a common shaft, and, together with their casings which are bolted together, form the pumping unit. This unit is normally located at the side of the locomotive and directly below the cab.

The condensing chamber consists of a drum-like body having within it several nozzles and tubes much like those used in live-steam injectors. This condensing chamber can be located either at the front end of the locomotives or at the pumping unit or, if more convenient, it can be located anywhere along the side of the boiler. Cold water from the first stage of the pump enters this condensing chamber and in passing through the nozzles and tubes it entrains exhaust steam from the exhaust passages. The resultant hot water is delivered back to the pump through the by-pass valve.

This by-pass valve, which is mounted directly on the pump casing at the suction to the second stage of the pump, is a pressure-loaded check valve. It receives the heated water from the condenser and, dependent upon the speed of the pump, either delivers all of this hot water to the second stage of the pump or by-passes part of it back to the suction of the first stage of the pump. The function of this by-pass valve is to maintain a proportional pressure differential between the cold water delivered to the condenser and the hot water delivered from the condenser. Because of this by-pass valve, the Turbo-Injector maintains a constant delivery temperature at a given exhaust pressure throughout the entire capacity range of the pump. This valve also makes possible the regulation of the capacity of the pump from a maximum down to 30 per cent of that maximum.

The operating valve is to control and to regulate the flow of live steam from the boiler to the steam turbine. This valve is located either inside or outside of the cab within easy reach of the engineman.

The combination check valve and control valve is usually located at the front end of the locomotive and placed between the condensing chamber and the exhaust passages. This valve makes it possible to operate the pump with the locomotive working or drifting or standing. When the locomotive and the pump are both working both valves in this combination valve are open to admit exhaust steam to the condenser. When the pump is not working, but the locomotive is, both of these valves are closed to prevent the exhaust steam from the cylinders flowing back into the pump.

The automatic heating valve, which is bolted directly to the combined check valve and control valve, admits live steam from the boiler to the condensing chamber during the periods when the locomotive is standing or drifting to heat the feedwater under these conditions to a temperature of 200 deg. F. or more. This makes it possible to use this system to feed the locomotive boiler, whether or not the locomotive is working, because it is impossible under any condition to put cold feedwater into the boiler. As its name implies, this valve works automatically and needs no attention what-

soever from the engineman. In addition to the above, a pressure and temperature gage is furnished. The pressure gage indicates the pressure of the water in the delivery pipe so that it is known that water is entering the boiler. The temperature gage indicates the temperature of the water entering the boiler at all times.

The operation of the Turbo-Injector is as follows: With the pump running, the water from the tender flows to the first stage of the pump and is delivered to the nozzles of the condensing chamber. As the water passes through these nozzles and into the condensing-chamber tubes, the exhaust steam from the locomotive cylinders is entrained and the mixture of exhaust steam and water is delivered from the condenser tubes back into the second stage of the pump. As this heated water passes to the second and to the third and then to the fourth stage of the pump, its pressure is built up gradually, so that when the water leaves the fourth stage of the pump it has sufficient pressure to lift the boiler check and discharge into the boiler.

The weight of the Turbo-Injector complete, including the various valves and exclusive of the piping, is 1,300 lb. The pumping unit itself weighs 800 lb. The Turbo-Injector has a maximum capacity of 14,000 gal. per hr., and its capacity can be regulated to any reasonable minimum.

The feedwater temperature attained varies with and depends upon the locomotive exhaust pressure, being approximately 15 deg. below the temperature of saturated steam at a pressure corresponding with the exhaust pressure. For example: Assume a locomotive is running with 10 lb. exhaust pressure. The temperature of saturated steam at 10 lb. pressure is about 240 deg. F. Under this condition it is said that the feedwater from the Turbo-Injector will enter the boiler at approximately 225 deg. F. with the savings in fuel and water related to the temperature rise of the water.

Union Pacific Streamliner Brake Tests

(*Continued from page 159*)

The automatic emergency stop was slightly shorter than the slow service straight-air stop at a similar speed.

Rates of Retardation—Rates of retardation were obtained from accurately plotted speed-time curves made from the record obtained on the instruments in car 3. The individual curves for runs Nos. 1, 6, 10, 12, 14, 20, 21, 22, 24, 25, 32, 35 are shown in the various graphs. The slope of the speed-time curve was used in determining the rates of retardation at various time intervals. The rates of retardation, as obtained on the decelerometer and by records of the brake-cylinder pressure were also used in determining the points at which the retardation changed, as well as maximum and minimum values. The average rate of retardation was about 2.8 m.p.h. per sec. during all of the stops. The tests during which the brake valve remained in service throughout the stop gave higher rates than when the brake valve was lapped. Automatic full service applications resulted in a maximum of 4.2 m.p.h. per sec. Train-control applications gave somewhat higher values, such as 6.5 and 5.7 m.p.h. per sec., respectively, for tests Nos. 20 and 21. When the Decelakron was set at its original values of 2 m.p.h. per sec. for low-pressure service, 2.5 m.p.h. per sec. for high-pressure service, and 3 m.p.h. per sec. for emergency service, the average rate of retardation during the stops was approximately 2.25 m.p.h. per sec. with a maximum of 2.75 m.p.h. per sec. Since the Decelakron was set back to its original value at the end of the tests and prior to placing the train in regular service, these retardation values would be expected to prevail on the train.

Brake-Shoe Temperature and Wear—The maximum brake-shoe temperature recorded was 380 deg. F. The wheel-surface temperature, after the high-speed stops, showed a maximum of 360 deg. F. The records of wheel and shoe temperatures were not taken on all of the tests, and therefore the values just given may have been exceeded on several occasions. The records taken were obtained after high-speed stops, and should represent values which would be expected in service. A small amount of metal was found bonded to the wheels after the high-speed stops, but it was not enough to cause any noticeable roughness.

Wheel Sliding—Accurate observations were not made for wheel sliding during the stops. However, visual observations were made just prior to several of the stops from high speed, and it was noticed that sliding occurred on truck No. 6 for about the last 2 ft. of the stop. The wheel revolution record taken on the lead axle of this truck showed no evidence that the wheel slid during any of the stops. This truck had the highest braking ratio, and therefore it would have been more likely for the wheels of this truck to slide than for those of any other truck. None of the wheels showed any slid-flat spots after the completion of the test run.

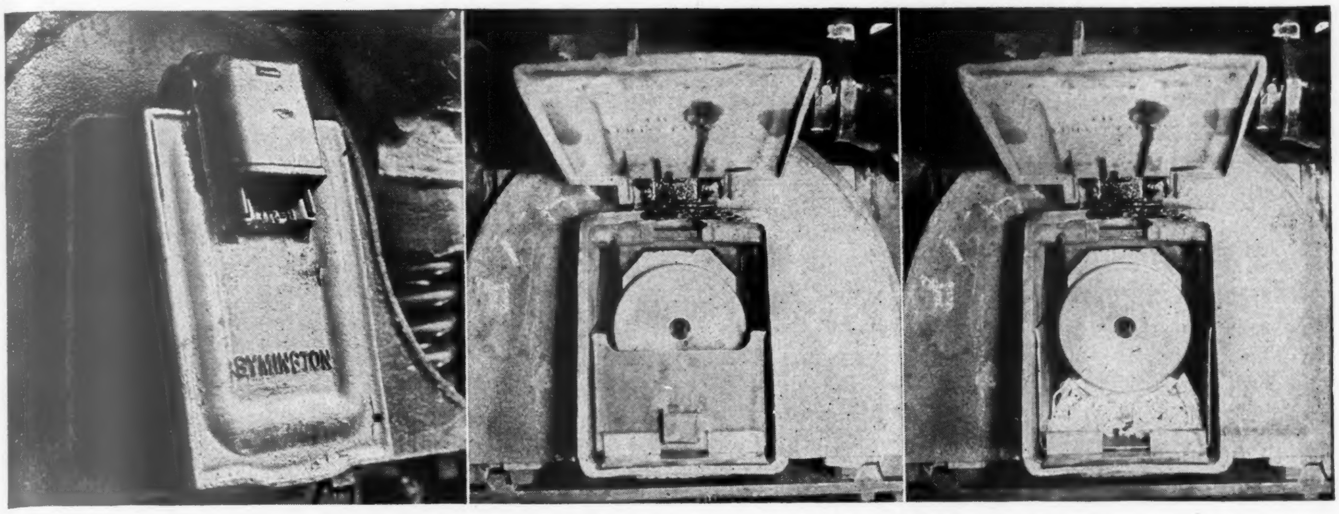
Conclusion

The general functioning of the various parts of the A H S C brake equipment was entirely as intended. The various devices responded quickly and produced the desired results. Stopping distances were within the required range and were considered satisfactory by the Union Pacific representatives present during the tests. The stopping distances compared favorably with those obtained on other high-speed trains in spite of the fact that the brake shoes on the City of San Francisco were not worn in sufficiently to give uniform bearing.

The Decelakron control tended to reduce high rates of deceleration, and in general performed this function satisfactorily. However, on several of the stops, particularly when the Decelakron setting was at the higher values, this device did not entirely prevent the build-up of high retardation rates near the completion of the stop. The tests showed that the highest settings advisable for general operation were 2 m.p.h. per sec. for low-pressure service (under 35-lb. brake cylinder pressure), 2.5 m.p.h. per sec. for high-pressure service (over 35-lb. brake-cylinder pressure), and 3 m.p.h. per sec. for emergency.

A few check tests, made with the control equipment in the cab set for automatic operation, showed that reliable operation could be obtained by this means. The stopping distance with service applications was of course longer than when using straight-air control because of the slower response and reduced brake-cylinder pressures. However, the automatic emergency stop was slightly shorter than the stop made with straight-air service application. The retardation rates near the end of the stops were higher in automatic operation than in straight-air operation because of the lack of Decelakron control. The train-control equipment functioned properly on the two check tests made.

Although the tests were limited to one day, it was possible to make a sufficient number of tests to demonstrate that the general functioning of the A H S C brake equipment under the usual operating conditions was satisfactory, and that the trains containing the equipment could be released for service operation.

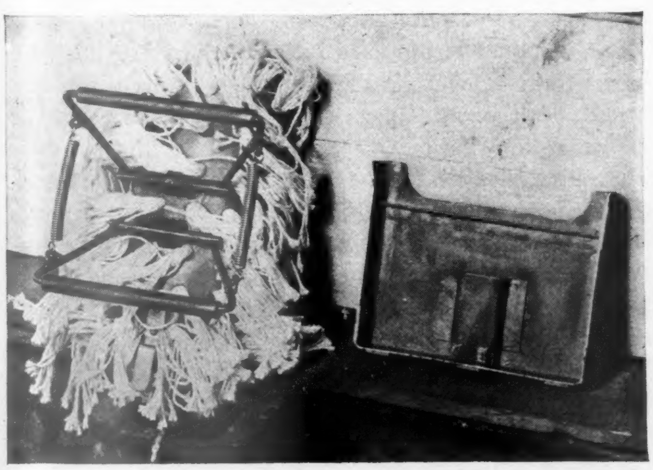


Magnus wick-type journal lubricator as applied to Southern Pacific Daylight train journal—Left: With journal box cover closed—Center: with cover up and the oil box visible—Right: with the end of the oil box cut away to show the lubricating pad

Magnus Wick-Type Journal Lubricator

Substantially higher sustained train speeds have greatly increased the difficulty of maintaining proper car journal lubrication, and to meet this problem, the Magnus Metal Corporation, Chicago, has recently developed a new wick-type journal lubricator, based on the results of extensive tests on the Southern Pacific and designed to give increased lubricating efficiency and lower running temperatures under the most severe modern operating conditions.

The new lubricating device incorporates some rather



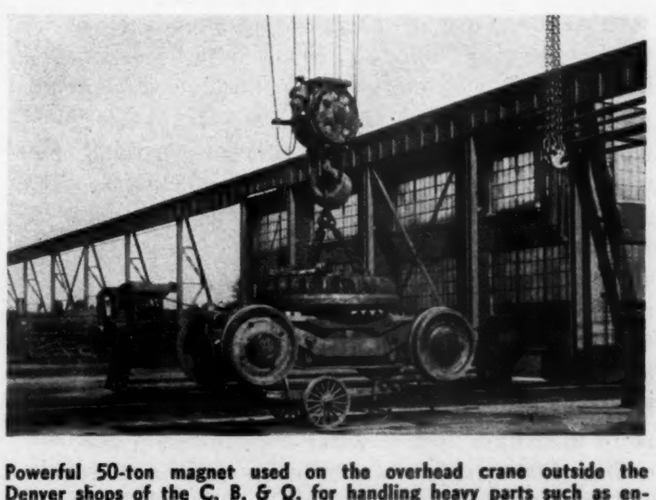
The spring-actuated supporting frame as applied to the lubricator pad—The end of the oil box has been cut away

startling departures from present practice, as it dispenses entirely with the conventional type of packing. The design includes a lubricating wool pad, formed to fit the journal, firmly sewed together into a single piece and fitted into a perforated metal form through which cotton wicks extend down into the oil. The pad and supporting form are held firmly against the bottom of the journal by a spring frame arrangement, as illustrated. The tension of the springs, maintaining a constant pull on the legs of the supporting frame, tends to pull these legs closer together and push the pad higher, thus compensating for wear and holding the pad firmly in contact with the journal, regardless of the jolts occasioned at high speed. Also, dirt, water or other impurities in the box cause no change in the contact of the pad with the journal. The bottom members of the spring frame are equipped with rollers to reduce wear and avoid any possibility of "sticking" in the action of the pad-supporting device.

The lubricating pad is enclosed in a rectangular metal oil box which slides into the journal box and has a felt gasket on the back, making a closure against the journal shoulder. The front of the oil box extends almost up to the center line of the journal and is equipped with an oil level-indicating device. This oil box prevents possible loss of oil as well as contamination of the oil supply with water, dirt and other impurities detrimental to lubrication. Since there is no loose packing to climb the journal, waste grabs and attendant overheated bearings and hot boxes are avoided.

The Magnus journal lubricator is applied to all car journals of the new Southern Pacific "Daylight" streamliner described in this issue of the *Railway Mechanical Engineer*. The design requires a journal box having a square bottom, with a lid covering the entire front of the box. The standard pedestal spacing is maintained. In addition to being applied to passenger equipment, this journal lubricator is adaptable to use on freight equipment. It is also being successfully used in lubricating locomotive engine truck and trailer journals.

* * *



Powerful 50-ton magnet used on the overhead crane outside the Denver shops of the C. B. & Q. for handling heavy parts such as engine trucks, scrap flues, driving wheels and other similar material

EDITORIALS

"Mopping Up" After The Ohio Flood

The courage, resourcefulness and concentrated efforts of railroad men in getting railway shops inundated in the recent Ohio flood back into some semblance of normal operation were nowhere better exemplified than in the case of the Illinois Central shops at Paducah, Ky. Although built with shop and enginehouse floors well above the previous record flood level, water entered the shop on January 23 and rose to a depth of 69½ in. above the shop floor on February 2 and then subsiding but did not leave the shop until February 15. The first members of the reconditioning force arrived in the shop on February 9 and by February 24 a few of the principal machines were ready for operation and locomotive repair work started.

During the flood, locomotives in the shop and enginehouse were inaccessible except by boat, and the turntable could not be operated. The power plant was out of commission, due to water in the basement flooding the coal-conveyor motors and transformers which operate air compressors. Moreover, the city water supply was shut off and water was not available for the boilers, even though the latter, as well as the heavy power-plant machinery, were on a floor above peak water level. Locomotives and machinery in the shops were all or partly submerged and the wood block flooring floated to the top of the water and was distributed throughout the various shop departments. The store-house basement was flooded and the shop yards were, of course, more or less littered with debris after the water had subsided. Shop clerical and payroll records were largely destroyed.

By the execution of plans carefully developed just as soon as the extent of the flood and attendant damage became apparent, some degree of order was attained in spite of these chaotic conditions in the comparatively short period of two weeks, and the shop and terminal reconditioning work was essentially completed five weeks after the water left the shop. On February 7, a train of 14 cars, equipped with a 10-day supply of food and drinking water, as well as a force of 26 men and material such as water pumps, blowers with motors, relief electric blowers, firebrick and other materials, left Chicago, arriving at Fulton, Ky., on February 8. A group of the men was transported by automobile and boat the following day to Paducah shops which still had more than three feet of water over the shop floor.

One of the first jobs was to pump out as soon as possible the power plant basement and provide a supply of fuel and water so that a battery of boilers could be fired up and furnish steam to heat the brick furnaces built to dry out and bake electric motor equipment. Lights and power being cut off entirely, temporary light was obtained for workmen in the basement of the power house by a gasoline motor-driven unit. Electric equipment, such as transformers which furnish power for air compressors and from which the oil had floated out, were then put in operation, also shop and enginehouse power circuits. Some new electric equipment was installed and approximately 525 electric motors were baked out.

Approximately 550 shop machines and furnaces were under water and required attention. It was necessary, in many cases, to disassemble the machines entirely and clean them of all dirt. Other machines, less affected, were cleaned by special pressure guns, forcing the cleaning compound through the machine, this being followed with the proper lubricant. Besides many thousands of dollars worth of company-owned small tools, the personal tools of mechanics that were submerged in water were also passed through the cleaning process. Other tools, such as air drills and air guns were blown out by use of a spray gun, using kerosene mixed with a small amount of lubricant. Some equipment, including electric welders was shipped back to the manufacturers for reconditioning.

Considering the extent of flood damage in this modern railway of the Illinois Central at Paducah shop, the success of mechanical-department forces in getting certain key machines in the shop in operation in less than two weeks after water was out of the shop and practically completing rehabilitation work in a period of five weeks is a notable achievement.

Facts About Machine Tools

There's a well-worn story that has been going the rounds since the early days of automobiles about the owner of a Model T Ford who had a mania for equipping his car with gasoline-saving devices. He was a willing victim for the salesmen of gadgets. As the story goes, he put on one device that saved 25 per cent of the fuel; another that saved 40 per cent; another that saved 20 per cent; another that saved 30 per cent. The result was that he reached a stage where he had to stop every 10 miles and bail out two gallons of gasoline. Ridiculous, you say! Certainly. The average auto-

mobile owner spends more money today for fuel than he did 20 years ago. But he gets a lot more performance for his money because the manufacturers have built performance into modern cars. Similarly, the layman, unacquainted with the development in the art of locomotive design might conceivably inquire why it is that the 30-year-old locomotive had a 10-ton tender while the modern power has a 20-ton tender. What he may not understand is that every one of those twenty tons of fuel on today's locomotive produces more ton-miles faster than can possibly be done by each of the ten tons on the 30-year-old power.

It has been pointed out many times that the problem which a mechanical officer faces in developing and controlling methods for the maintenance of railroad equipment is one so intricate and so varied in all of its ramifications that it is extremely difficult to visualize it as a whole. The builder of locomotives and the manufacturer of locomotive devices places before the railroads his claims that he can save so much money by the use of his product. The manufacturers of passenger- and freight-car materials and specialties offer their products as factors contributing to economies. The producer of machine tools and shop equipment for the back shop and the engine terminal knows that the railroads can save money if they will install modern facilities. The job of the mechanical officer is to consider all of these claims, separate those offering the greatest immediate prospects for economy and then figure out for which of the numerous projects that he would like to carry out he is most likely to be able to compete successfully with the demands of other departments for capital expenditures.

How Much Will a Machine Tool Save?

The subject of equipment maintenance can be discussed endlessly on a general basis without arriving at any solution or even a clear understanding simply because it involves too many varying factors, any combination of which may affect a result adversely. So, it is necessary to be specific. Let's take the subject of machine tools, for example. A mechanical officer does not think entirely in terms of machine tools, for of all the problems that come to him in the course of a day's work less than one out of ten involves machine tools. What he wants to know is: How much will a machine tool save; how much will it cost, and does the saving justify the cost?

If you've got the answer to those questions, in relation to his specific situation, you at least have something in which he is interested. He knows from experience that unless he is able properly to control the factors to which a machine is definitely related the cost of locomotive repairs might increase in spite of marked reductions in the cost of machining locomotive parts. The mechanical officer assumes that the members of his staff—the machine-tool supervisor and the mechanical engineer—and the responsible shop supervision—the shop superintendent, the general foreman and the machine-shop foreman—whose duties require that they be interested in machine tools, in part or as a whole, are well informed as to the possibilities of modern tools. Those are the men to whom the educational and sales efforts of the machine-tool builders must be directed. It is to the builders' representatives that these men must look for the information that enables them to make intelligent recommendations to superior officers.

The indications are at the present moment that the railroad industry is going to represent a market of considerable importance to the builders of machine tools and equipment. There are manufacturers who approach the problem of supplying the railroads with an intelligent understanding. They will profit by that understanding. There are those who feel that, because of an apparent lack of appreciation of the value of their particular products (some of which may not be appreciably better in the railroad shop than the tools now in use), the railroad man is hopelessly set in ways of backwardness and does not want to be helped. To these latter manufacturers the railroad market will be distinctly not worth while.

The Railroads Need New Tools

First, let's get one fact straight. The railroads need modern machine tools. The need does not necessarily arise alone from the fact that many shops contain 20-, 30- or even 40-year-old tools. Many such tools perform only a stand-by service, taking occasional jobs when work becomes temporarily congested at the regularly used machines. The worst that can be said of them is that they occupy floor space. These older and infrequently used tools are not particularly important from the replacement standpoint for a study of the potential economies as a result of replacement would probably indicate that the savings would not justify the change being made. The railroad man, therefore, is not going to be particularly receptive to the suggestion that all old machine tools in his shop be replaced with modern prototypes.

He is, however, vitally interested in any installation that will return to his company a saving of not less than 17 to 20 per cent on the investment. In the case of one road a saving of 26 per cent on the investment was estimated in a group of new tools on the basis of using them 16 hours a day. In spite of the fact that the total machine-hours of this group of tools has today, after a little over a year of use, reached a total of only 42 per cent of the 16-hour-day potential the actual savings have been 19.5 per cent on the investment. The expenditure for the new tools has been justified. It is obvious from this case that the road needed the new tools.

Not long ago we had occasion to visit a newly built industrial plant in the company of the works manager and, when questioned as to the period of time in which the machine tools would be expected to pay for themselves, he replied, "Six years." Why so short a time? Because, these tools will probably be operated 24 hours

a day. Here lies one of the essential differences between an industrial shop and a railroad shop—on an eight-hour shift basis it would take from 17 to 35 years to get the same amount of use from a railroad machine tool. In all too many cases, particularly in relation to production machinery, the tool is obsolete before it has outlived its mechanical usefulness. It is significant that railroad shop men are recognizing the desirability of extending the daily service hours of machine tools in order to get the maximum of serviceability out of the tools before they become obsolete.

This discussion might be carried on indefinitely but it can be profitably concluded at this point by facing one set of facts: that the older machine tools in railroad shops working on the major machining operations can be replaced by modern tools with resultant substantial savings; that a recognition of the fact that specific applications resulting in savings of 17 per cent or more on the investment will get the first consideration; that railroad machine tools must meet the requirements of railroad shop conditions, not those of other industries. The manufacturer who approaches the railroads with an understanding of these basic facts will undoubtedly discover that they are in a receptive mood.

I.C.C.'s Golden Jubilee

The Interstate Commerce Commission celebrated the completion of fifty years of service on March 31, 1937. The Act creating the Commission did not, of course, contemplate the extensive and onerous type of regulation now in effect. No fair-minded person will deny the wisdom and necessity of a certain degree of regulation for the public utilities. Regulation, however, which may have seemed advisable when the railroads competed for business only among themselves and were considered a monopoly, is neither necessary nor desirable when other types of common carriers enter the field, and this is particularly true when such other carriers are, in effect, subsidized or are not subjected to comparable regulation. It is important, therefore, in the public interest that the Commission, under the direction of Congress, should construe its power in a much broader light as it enters the second fifty years of its existence. All of which in no way reflects upon much of the excellent work done by those departments of the Commission which come into most intimate contact with the mechanical department—the Bureau of Safety and the Bureau of Locomotive Inspection.

It is interesting to note from the first annual report of the Interstate Commerce Commission, that the railroad mileage of the United States, computed to the close of the fiscal year 1886, was only 133,606. The first report also contains this significant statement: "The railroads provide for the people facilities and conveniences of a business and social nature, which have become altogether indispensable, and the importance of so regulating these that the best results may be had, not by the general public alone, but by the owners of railroad property also, is quite beyond computation." It is to be feared, however, that the Commission has not always kept this objective clearly focused in its mind and that it has sometimes overlooked the interests of the owners. In the last analysis, the best interests of our people will be served only when a proper balance is maintained between the interests of the general public, the owners and the employees.

New Books

TURNING AND BORING PRACTICE. *By Colvin and Stanley. Published by McGraw-Hill Book Company, New York, N. Y. 453 pages, 5½ in. by 9 in. Cloth bound. Price $4.00.*

This book is divided into five sections, covering the fundamental operations of engine lathes, turret and semi-automatic lathes, automatic screw machines, boring machines, and tools for cutting different materials, respectively. The first section, comprising the first seven chapters, is devoted to engine lathes in which the authors discuss the development of the machines and chucks, the chucking of material, turning taper, and thread cutting. The second section, comprising chapters 8, 9 and 10, is devoted to turret and semi-automatic lathes, their construction and uses in production work. Section three, comprising chapters 11 to 17, inclusive, cover setting up and operating automatic screw machines and a description of the various types of automatic screw machines and accessories such as spring collets, feed chucks, taps, dies, forming tools, drills, reamers and recessing tools. Section four, consisting of chapter 18, gives a description of many types of boring machines, including characteristic features and operative functions. Section five, comprising chapters 19 to 24, inclusive, is devoted to a discussion of tools of all types for turning metallic and non-metallic materials. The last chapter discusses coolants and cutting fluids for various machine operations.

LA LOCOMOTIVE ACTUELLE (THE MODERN LOCOMOTIVE). *By R. Vigerie and E. Devernay, Northern Railway of France. Published by Dunod, Paris. 607 pages, 552 illustrations. Price 56.25 francs, paper bound; 66.25 francs, cloth bound.*

This book is based on "Le Mecanicien de Chemin de Fer" by Pierre Guedon, the last edition of which was dated 1920. The book, however, has been practically rewritten and brought up to date. The original mathematical calculations have been retained as these were carefully worked out for the original book by a body of well-known technicians. The book opens with an historical lead followed by a theoretical treatment of the principles involved in steam locomotive design. The various details of a locomotive are then taken up quite fully and covered both descriptively and theoretically. The many illustrations are well chosen.

THE READER'S PAGE

N. & W. 2-6-6-4 Type Articulated Locomotive

To the Editor:

The Norfolk & Western high-speed articulated locomotive described in the October *Railway Mechanical Engineer* is a very remarkable machine, and some even more remarkable figures are quoted in connection with its performance. The record output of 6,300 drawbar horsepower, or one horsepower for each 90.5 lb. of engine weight, is far in advance of anything yet claimed for any other articulated locomotive. The Southern Pacific 4-8-8-2 type locomotives, for example, can develop 5,000 drawbar horsepower at 38 miles per hour.* This is one horsepower for each 123 lb. of engine weight. The 2-6-6-2 type fast freight locomotives built for the Baltimore & Ohio in 1931 have recorded 3,600 drawbar horsepower at 42 miles per hour.† This corresponds to 129 lb. of engine weight per horsepower. It is interesting to note that although the Norfolk & Western locomotive is only 22½ per cent heavier than the Baltimore & Ohio engines, its drawbar pull at speeds of 60 to 65 miles an hour is claimed to be very nearly twice as great.

In your editorial on page 441, some further comparisons are made which present two other locomotives in a more or less unfavorable light. The value of all these comparisons would be enhanced if we knew whether the curves on page 426 represent the output which the N. & W. locomotive is capable of delivering over an extended period of time, or whether they merely depict its momentary maximum performance. By selecting only the high peaks from a series of dynamometer records, without paying particular attention to uniformity of speed and drawbar pull over a sufficient distance in the vicinity of the selected points, it is possible to prepare a drawbar pull-speed curve which may be considerably above the normal capacity of a locomotive. In the absence of any detailed data, it is not possible to say if this has been done in the present case.

Several vital bits of information are missing from your article. What is the water consumption of the N. & W. locomotive when operating at full capacity? How much water can be evaporated in the boiler without resorting to excessive rates of firing? If we may judge from the known performance of other modern articulated locomotives, the N. & W. locomotive can scarcely require less than 19 or 20 lb. of water per drawbar horsepower hour when operating at the cut-off necessary to produce 6,300 horsepower. Assuming the ability of the heater to deliver feed water at the boiling point, the required equivalent evaporation per square foot of evaporative heating surface would be at least 18 lb., which is rather a large order for a boiler with 24-ft. tubes.

Reference is made on page 421, to the speeds attained by this locomotive with very heavy trains. Handling 4,800 tons up a straight grade of 0.5 per cent at 25 miles per hour should present no special difficulty, as it involves the equivalent of 4,800 to 5,000 hp. at the tender drawbar on level track. The hauling of a 7,500-ton train at 64 miles per hour on "comparatively level tangent track" is, however, something entirely different. In this instance, if we assume the drawbar pull to be as shown on the curve on page 426, we arrive at a train-resistance of around 4½ lb. per ton, which is incredible. The obvious answer to this is that the train must have been running downgrade at the time.

W. T. H.

* See Baldwin Locomotives, January, 1930, page 54.
† See Baldwin Locomotives, July, 1932, page 4.

Tool Marks—and Other Things!

To the Editor:

Apropos of F. H. Williams' articles on the finish of fits and the causes of failures, particularly of crank pins, and his theory about these failures; also his suggestion for undercutting to relieve the stresses. Constructive criticism is the soul of progress and the following comments are submitted in this sense.

Any study of a fracture is a post mortem; in other words, anyone can read the pips on dice after they are rolled. A post mortem is held on the material which has failed and if a tool mark is evident, the easiest way out is to let it bear the onus for the failure. Did it ever occur to you that tool marks are a form of close spiral and that it is practically impossible for a fracture to occur except on a tool mark? Has any designing engineer or metallurgist ever called his shot and pointed out in advance where a fracture would occur? I am referring to parts in service and not laboratory specimens.

Agreeing with Mr. Williams for the moment that tool marks are one of the causes for facture, it must also be pointed out that a ground surface, buffed and polished after being ground, will show marks if a microscope of sufficient magnification is used. How far should we carry this? Where shall we draw the line? As a matter of fact, no surface is perfect.

Why are breakages rare on newly built locomotives? Is it because all the parts are in proper alinement? My observation has been that there are plenty of tool marks on the parts of these newly built engines, even when they come from the locomotive builders which specialize on their manufacture. After several shoppings it becomes necessary to renew axles and crank pins. Here and there slight errors caused by wear are ignored for the sake of expediency. Frames may be worn or out of line. The hubs may be worn. The amount of these differences from the original construction may not be much in each instance, but added up, they may be considerable.

Let us consider some of the other factors which may cause breakage. What about rough handling of the locomotive in making up the train, for instance, or the emergency application of the breaks? If a rod bearing runs hot, does the crew put water on it in order not to lose time, or to make up lost time? What about sudden starts on the first moving of a locomotive on a frosty morning? What happens if the rod bushings run too long before renewing, or if there is a lack of lubrication, even for short periods of time? These things are not evident when the fracture is studied in the laboratory.

It is a matter of record that after engines have had

several shoppings, breakages become more frequent. Is it fair then to charge the breakages to tool marks, or is it because the parts may be out of alinement, or have not been properly maintained, so that in conjunction with other factors, such as those mentioned above, the parts finally give way?

Is the designer not at fault in many instances? I know of one class of locomotives on which crank-pin failures were practically eliminated by increasing the diameter of the crank pin by ¼ in. It is only fair to say that tool marks are still with us on these larger crank pins.

Some of the illustrations used with Mr. Williams' articles show figures or lettering stamped on the finished parts. These stampings are much deeper than ordinary tool marks. Has a fracture ever been traced to them? True, they are not at the most critical points, but surely they could be placed in less prominent places than indicated in Fig. 9, page 61, or Fig. 15 on page 62 of your February number.

My hat is off to Mr. Williams for bringing this subject out into the open. It certainly has started discussion and out of it we may find ways and means of improving our practices, with a view to minimizing failures. I am afraid, however, that he has put all his eggs in one basket, ignoring other sources which contribute to these fractures.

FRANK W. ALWARD

Checking Locomotive Counterbalancing

TO THE EDITOR:

During recent years so much has been written about the counterbalancing of locomotives that further discussion might appear superfluous. There are still, however, one or two points which seem worthy of additional thought.

The advantages to be obtained from transverse balancing, or cross-balancing, have at last been more widely recognized in the United States. Contrary to the belief entertained in some quarters, cross-balancing is not entirely a recent importation from Europe. The principle was well understood and practiced to a limited extent in North America at least half a century ago.* Perhaps if all American railway civil engineers in former years had possessed the same degree of authority and prestige as those of Europe, cross-balancing and a few other refinements of locomotive design might long ago have become the rule, rather than the exception. The design of European locomotives has been strongly influenced by the power of the civil engineer to veto the use of any rolling stock which he considers unduly injurious to the permanent way.

Those who delve into the intricacies of counterbalancing soon find various discrepancies in the methods of applying cross-balancing in vogue in different countries and on different railways. In many cases, cross-balancing is applied to *all* the coupled wheels; in others, only the main driving wheels are so treated. While probably the majority of engineers proceed upon the arbitrary and frequently dubious assumption that from three-fifths to two-thirds of the weight of the main rod may be considered as rotating at the crank-pin, others prefer to expend the time and labor necessary to obtain a more accurate figure. For the sake of "simplifying" matters, quite a number of both European and American engineers are disposed to treat the eccentric cranks as concentrated entirely at the crank pins. European engineers usually make due allowance for the fact that the reciprocating parts and the balance weights move in different planes, but some American authorities assert that this difference is of no consequence. Plausible arguments can be produced in support of any or all of these variations, but the cumulative effect of arbitrary assumptions and disregard of minor disturbances certainly does nothing to improve the balancing of an engine.

The ultimate goal of locomotive counterbalancing is to insure that the revolving parts are perfectly balanced, and that a definite pre-determined proportion of the horizontal disturbance occasioned by the movement of the reciprocating parts is also counteracted by revolving weights in the wheels. Owing to the very nature of driving wheel castings, it is virtually impossible to achieve a correct balance on the basis of calculations alone. What then can be done to provide reasonable assurance that something resembling the desired result will be attained under actual running conditions? The A.A.R. recommended practice for rechecking the main wheel counterbalances of a cross-balanced two-cylinder engine† is, or should be, well-known. The liability to error inherent in this complicated process will be apparent to anyone who studies it carefully. After all the complex mathematics and shop operations are completed, we have a pair of wheels which appears to be correctly balanced when standing in one particular position, but we do *not* know how those wheels will act when revolving several hundred times per minute. If anything approaching a really accurate cross-balance is to be obtained, the old-fashioned balancing ways will have to be superseded by something even better than the device possessing the "important advantage of greater sensitiveness," described on page 41 of your January number.

Some years ago, the necessity of eliminating some of the uncertainty surrounding the practical aspects of locomotive counterbalancing became apparent to the late G. J. Churchward, then head of the mechanical department of the Great Western Railway of England. A so-called "wheel-balancing machine" was thereupon built in the works at Swindon, and similar machines have since been installed in the London & North Eastern works at Doncaster and in the London, Midland & Scottish works at Crewe. Complete descriptions of these machines may be found in several English books and periodicals, so no detailed account is necessary here. They consist essentially of a framework embodying two spring-supported bearings in which a pair of mounted driving wheels can be held and driven through a flexible shaft by an electric motor. Any vibration of the wheels and axle when in motion is absorbed by the coiled springs, which are arranged radially around the bearings. Circular weights to represent the revolving parts and the desired proportion of the reciprocating parts are attached to the crank pins in the proper planes, and the wheels are then rotated at high speed. Violent oscillations usually occur at the first trial and the counterbalance must then be adjusted until steady running of the wheels is attained. Results conservatively described as "surprising" are often obtained with wheels thought to be correctly balanced theoretically. Probably few pairs of American driving wheels would run very smoothly if tested in the manner described.

There might be some difficulty in adapting the English wheel-balancing machines to American requirements, particularly with regard to the drive from the motor to

* See a paper by Francis R. F. Brown, "On the Construction of Canadian Locomotives," in Proceedings of the Institution of Mechanical Engineers, May 1887, page 257.

† See Railway Mechanical Engineer, August 1930, page 453.

the wheels, because of space limitations and the larger weights involved, but surely the ingenuity of American mechanical engineers should be equal to the task.

WM. T. HOECKER

Locomotive Road Tests

TO THE EDITOR:

I would like to see the *Railway Mechanical Engineer* publish more results of dynamometer car road tests of locomotives. I am particularly interested in test results complete enough to reveal the codes employed by the various railroads in making computations on an hourly basis.

The A.S.M.E. Power Test Code for Road Tests for Steam Locomotives, series 1923, par. 66, page 23, states, "Item 104, Duration of test or running time, is the actual time between the start and stop of the test minus the time consumed in stops. Item 104 is to be used in all calculations leading to the expression of results of coal and steam consumption per hour."

This seems to me to overlook periods of drifting, during which the rates of combustion and evaporation are practically the same as when the locomotive is standing. If the profile is such that there is 15 or more minutes of drifting included, considerable difference will be shown in consumptions per hour, horsepower hour, square foot of grate area and heating surface per hour, according to whether running time or working time is used.

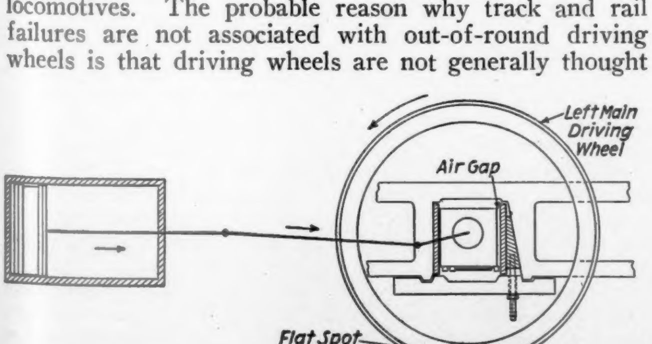
When consumptions on an hourly basis are made on time working, it naturally follows that deductions should be made of coal used for periods of drifting longer than five minutes, the same as outlined in the A.S.M.E. Code, par. 55, for stops longer than five minutes. This practice more nearly approaches test plant conditions, if road tests must be made on territory which is not all level or ascending grades, and disposes of misleading results when an appreciable amount of drifting is included.

INSPECTOR, TEST BUREAU

Flat Driving Wheels Cause Rail Failures

TO THE EDITOR:

On reading reports and discussion of causes of rail failures and other damage to track, I have failed to notice any reference to the effect on rail of out-of-round locomotive driving wheels, which wheel condition is undoubtedly most destructive to rail and track in general, especially since the advent of high-speed trains and locomotives. The probable reason why track and rail failures are not associated with out-of-round driving wheels is that driving wheels are not generally thought of as being out of round. If track men knew the number of locomotives with out-of-round driving wheels that are pounding rails with terrific hammerblows, causing not only rail separation from tie plates, but also kinking and breaking of rails, they would certainly seek means to prevent it.



Position of left main driving box during the back working stroke on the right side of the locomotive—As the left engine begins its back stroke, the air gap is closed causing the box to pound and the wheel to skid, and wear out of round

The writer has studied the subject of rail failures, and the extent to which abnormally worn tires of locomotive driving wheels contribute to it. The result of this study is summarized as follows:

All American railroads but one use right lead locomotives, and therefore this discussion is devoted to such locomotives. Since the adoption of grease for axle lubrication, high running temperatures of driving boxes, and the resulting expansion of these boxes, cause them to pound. The writer has found that this pounding is most noticeable in the left main driving box and that it causes the tire of the left main driving wheel to wear out of round. This out-of-round condition, which as a rule cannot be detected by sight and does not make a clicking sound on the rail such as that caused by wheels worn flat when locked by a driver brake, is formed because the wheel is turning at the same time that it is skidded by the thrust of the left piston. This skidding occurs each time the piston thrust forces the left main driving box against the wedge. The skidding action is accentuated as the size of the air gap, shown in the drawing, is increased.

The position of the left main driving box shown in the drawing, at which position there is an air gap between the driving box and the wedge, is caused by the force exerted by the piston on the right side of the locomotive. This latter force always drives the left main box forward against the shoe at the moment the left piston begins its backward stroke.

T. P. WHELAN.

Value of Proper Machine Finish

TO THE EDITOR:

For the past few months you have been running a series of articles by a man connected with the Canadian National Railways and I have found them very interesting. From the number of complimentary letters in the last *Railway Mechanical Engineer* (Gleanings, December, 1936, issue) I can see that I am not alone in my appreciation.

Something over a year ago (April, 1935) you had an article originating with the Timken people, explaining a method of theirs to reduce breakages on wheel and other press fits, by grooving the hubs to reduce localized stresses. This article was so much to the point that I bought a number of copies for distribution to my friends.

In my own experience I have seen many large shafts —14-in., 16-in. and 18-in. in diameter—broken because of poor machine work or because of corrosion. The users almost invariably blame it on the material; it is almost impossible to convince them that their own sloppy machining is at fault.

I know of a case where a piston rod broke, time and again, where the rod was necked down, with a square shoulder, to go through the piston. This was an almost yearly occurrence and they grew tired of it. They made a new rod with a generous fillet and turned off the square edge of the piston to suit, and in the 20 years they ran the machine, after that, they never had any more trouble.

RICHARD H. WORCESTER.

Gleanings *from the* Editor's Mail

The mails bring many interesting and pertinent comments to the Editor's desk during the course of a month. Here are a few that have strayed in during recent weeks.

Obscure Defects in Vital Places

F. H. Williams, in his illustrated articles on locomotive failures, has given us many illustrations of progressive fractures of various parts—parts which are vital in the interests of safe and reliable operation. One cannot but speculate on the damage to life and limb and goods, which may result if such defects are not discovered before the final break occurs. Do you know of any road that specially rewards employees for finding obscure defects before the parts fail? I have been told that at least one railroad formerly paid a bonus for discovering such defects, but unfortunately I have been unable to locate any record of it.

Clubs for Railroad Model Makers

There are upward of 30 good, live-wire Model Railroad Clubs in larger cities, which, beside being ardent boosters for the "big" roads, have open house and periodically have exhibitions that attract thousands of visitors. I know people (I refer to the many thousands who have forgotten that railroads existed) were astounded to see such interest manifested. The result is that all who see these little trains in operation are from then on "railroad minded". I have had the pleasure of explaining the difference between a single and double-sheathed box car, various types of open top cars, why some locomotives have more wheels. Women always ask intelligent questions. There seems to be no end to the interest.

Does It Pay?

Recently one of our machine tools broke down and it was necessary to secure a new part. The maker stated that this particular machine had become obsolete 15 to 20 years ago and that the cost of making the new part would be prohibitive, since the patterns had been destroyed. What am I to do? We can probably find some way of making a new part in our own shops, but naturally it will be costly, although the expense will be absorbed in the general operations and probably lost sight of. The repaired machine cannot, of course, compete with the more modern types, either in output or quality of work. I know that many supervisors in other shops are confronted with the same problem. What are they doing?

Big Men Wanted!

I dropped in at my Alma Mater a short time ago. Things have changed greatly since I was graduated. Among other new stunts I found a Personnel Department. Nowadays they seem all geared up to help the graduates find jobs. I had to fight like the devil to secure one when I was shoved off. The man in charge of the Personnel Department showed me some of the inquiries for men that had come from the industries. Included in these was one from a railroad. Among the basic requisites were good character and family; good size (six feet in height), appearance and personality. It is true the request came from the traffic department, and not from the mechanical department. Maybe they do need size and personality, rather than some other important things that are not quite so evident on the surface. The real jolt—and it is equally true for our mechanical department recruits—was to learn that the starting salary suggested was considerably less than half that paid by other types of business.

Apprentice Yearnings

The editorial, Apprentices on Tour, in your February issue, was sure fine, and I for one wish that I could enjoy an opportunity for such a sound and complete method of learning the trade. The item, "Finished" Apprentices, on your Gleanings page hit me squarely between the eyes. Well, I hardly believed that anyone else could know the feeling a man has in his heart when he has to face a situation like that, unless it was one of those who had had such a really sad experience. **** We have no apprentice instructors, no class work of any kind, just get what we can from the machinists we are working with, or anyone else handy who may have some idea that will prove helpful.

Through the Eyes of an Apprentice

I really feel that our master mechanic is one of the fairest, finest and most considerate gentlemen I have ever known. As I see him passing through the shop most every morning on his way to the office, walking so straight and dignified, even with the burden of his many years, plus the great responsibility of his job resting on his shoulders—still so much at ease in his every movement—it inspires me in my efforts to keep on trying. It stimulates a desire in me to be just like him, to know how to do my work so well that I can meet almost any situation that may arise and handle it efficiently and easily, and do a nice job of it, just as he is and has been doing for a great number of years.

Something to Ponder Over

Personally, I believe too much stress has been laid on the sciences of production. After all, man is more important, and what has been done with him? The man of yesterday was just as good a thinker as the man of today, and he would respond just as quickly. Yet he drove an oxcart, while the man of today drives a high-powered car. Here lies our trouble. The sciences of production have gone far ahead of the development of the men who operate the industries. Man's mind is still back there somewhere, riding along in his oxcart, but his body is going along at 60 miles an hour. The executive today, who handles the destinies of 125 million people, has the same mind, basically, as the first leader of our country. who presided over only a few million people.

Practical Research

I am a graduate of an engineering college and have had some opportunity of studying industrial practices. I have had experience in both college and industrial plant laboratories. With such a background it seems to me that some of our practices on the railroads are crude and inefficient. Consider, for instance, the statement made by Lawrence Richardson of the Boston & Maine, in his recent paper before the New York Railroad Club. "Air hose life is woefully short," he said. "It is surprising to find how few of them are removed on account of aged rubber. Examination of removed hose discloses numbers less than a year old, removed by reason of tearing, particularly at the angle cock nipple. There is a cutting action at the edge of this nipple when hose are not uncoupled in cutting cars." Such conditions are not only costly, but they involve the safety of the train. Surely the railroads would be warranted in making careful and critical researches to determine how such conditions could be improved. Mr. Richardson did indicate that trials are now being made with nipples with rounded edges. When one considers, however, that this air hose difficulty is a chronic condition of long standing, it simply emphasizes our short-sightedness when we get into a rut. This comment is inspired by the item on the Gleanings page of your March number, entitled, Eyes That Do Not See.

With the Car Foremen and Inspectors

Assembly of Reading Gondolas Involves Interesting Methods

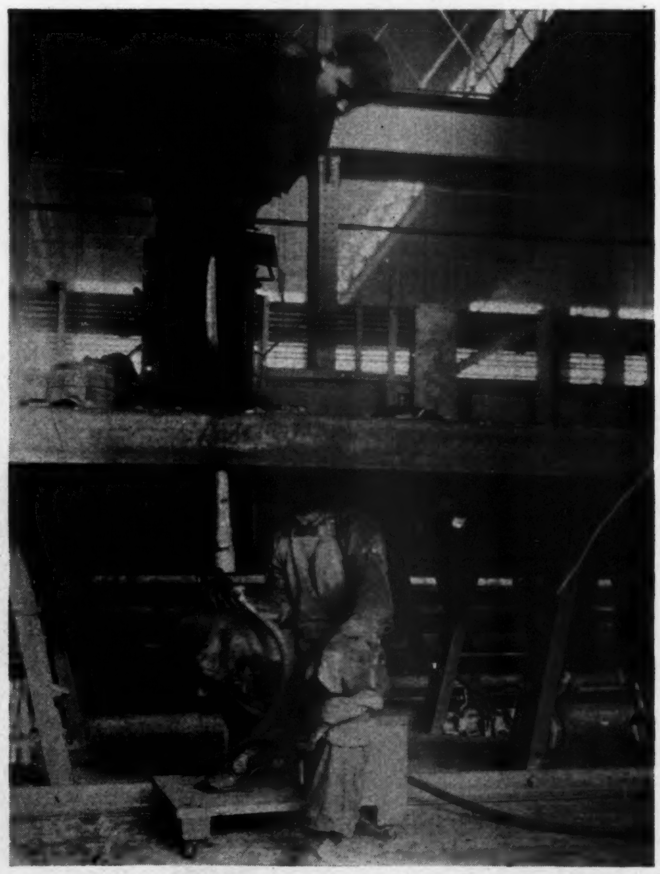
Early last month the Reading turned out of its Reading, Pa., freight-car shop the first of a series of 200, 65 ft. 6 in. steel drop-end gondolas. The principal dimensions of these cars are shown in the accompanying table. The underframes are of all welded construction having center sills composed of 10-in. ship channels weighing 25.3 lb. per ft. These underframes are designed for the Duryea cushion gear. The sides of the car are of $\frac{5}{16}$-in. carbon steel with $\frac{5}{16}$-in. pressed side stakes and collapsible inside stae pockets. Each car side consists of a center section sheet and two end sections making up the 65 ft. 6 in. complete side. The joints between the end and center sections are so designed that a side stake, with inside butt strap, forms the connection. The top rail consists of a 5-in. 19.3 lb. per ft. bulb angle. The floor angle is 3 in. by 3 in. by $\frac{3}{8}$ in. and the side sill angles are 6 in. by 4 in. by $\frac{5}{8}$ in. Fabricated welded end gates are used on these cars. The floor is of $2\frac{3}{4}$-in. oak. Other equipment on these cars consists of Type E bottom-operated couplers, Westinghouse Type AB brake equipment, Ajax hand brakes, four-wheel trucks with cast-seel integral box side frames, 6-in. by 11-in. journal axles and 33-in. multiple-wear rolled-steel wheels. The truck springs are double coil, six nest, having one Cardwell-Westinghouse friction spring in each nest.

These cars are assembled at five spot positions on tracks 5 and 6 of the freight-car shop, a layout of which was published on page 157 of the April, 1936, issue of the *Railway Mechanical Engineer* in connection with the operations on another type of car which was going through the shop at that time. The accompanying illustrations show the details of many of the various steps in the assembly of these cars. The trucks are assembled at an especially set-up position where the handling facilities were such as to enable the work to be carried on rapidly and without interference with the other construction work.

As may be seen from the illustrations, the truck assembly job is set up on a production basis. A pair of wheels with wooden spacers and the truck bolster are rolled into position under an electric hoist operating longitudinally over the track where the trucks are assembled. The side frames are lifted by electric hoists from storage space at each side and are placed with the journal brasses on the journals. The application of the springs, spring planks and truck brake rigging complete the assembly of the trucks. After assembly the trucks are delivered to the body assembly track.

One of the major operations involved in the construc-

Material for the car sides is placed, in the proper quantity for immediate use, at a position adjacent to the assembly jigs



The rivet heaters are on top of the car side on the jig and the riveters work on movable dollies from underneath

tion of these cars is the fabricating of the car sides. This is done at the first of the five spots on special jigs so designed as to accommodate four complete car sides. The entire operation of assembly is planned in such a manner as to produce four finished cars for each eight-hour working day. The job of assembling the car sides on

Principal Dimensions of Reading Steel Drop-End Gondolas

Length, inside, ft. and in.	65– 6⅛
Width, inside, ft. and in.	7– 9
Height of side above floor, ft. and in.	3– 6
Length over end sills, ft. and in.	66– 1½
Length, coupled, ft. and in.	70–10¼
Width, over hand brake, ft. and in.	8–11⅝
Height from rail to bottom of side, ft. and in.	1– 4⅛
Height from rail to top of floor, ft. and in.	3– 9⅝
Height from rail to top of side, ft. and in.	7– 3⅝
Truck centers, ft. and in.	56– 7
Truck wheel base, ft. and in.	5– 8
Total wheel base, ft. and in.	62– 3
Capacity, nominal, lb.	140,000
Capacity, cu. ft. (level full)	1,777
Light weight (sample car) lb.	63,300
Load limit, lb.	146,700
Ratio light weight to load limit	1 to 2.32
Minimum radius curve, ft. and in.	150– 0

the jigs consists of assembling the center and end section side sheets, side stakes, top and bottom side angles, floor angles, butt straps and collapsible side stake pockets.

Unlike some assembly operations of its kind, these sides are fabricated in a horizontal position on the jigs with the rivet heaters working on top of the car side and the

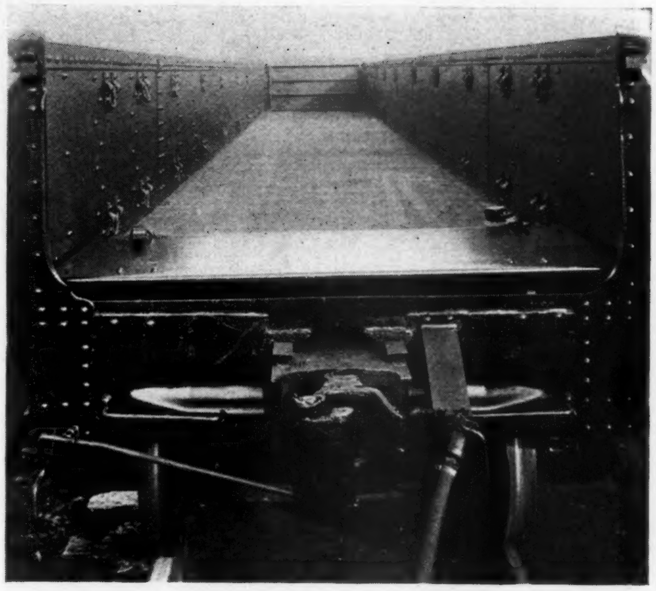
The twelve pictures on the opposite page show the more important stages of the assembly operation. Nos. 1 and 2—The trucks being assembled. Overhead electric hoists are used to handle the truck parts after the wheels and bolsters are rolled into position. Nos. 3, 4 and 5, respectively—The car side assembly jig; one of the center section side sheets being placed in position on the jig; a car side on the jig ready for riveting. No. 6—The completed side being lifted off the jig for placement at the proper spot for assembly. Nos. 7, 8 and 9—Three stages of the operation of placing the underframe on the trucks ready for the sides. Nos. 10 and 11—The sides being set in position ready for riveting to the underframe. No. 12—The end construction of the car.

riveters working from underneath. An unusual feature of this riveting operation is a dolly truck of special design for the riveters. This dolly truck permits the riveters to sit down at their work, moving from one location to another on the floor by means of casters on the dolly. The riveter uses the riveting hammer in a vertical position, the weight of the hammer being held on his knee on special pads provided for the purpose. In each of these car sides there are 857 rivets.

At the second spot in the assembly operation the sides are fitted to the underframe which previously has been placed on the assembled trucks.

When the sides are placed on the underframe at this point in the assembly operation, they are held in place prior to riveting by special fitting bolts and a special design of yoke clamp is used at the end sill position at either end of the car to pull the side up against the underframe for riveting.

At this spot the couplers, grab irons, corner posts, brake forgings and brake equipment are applied. The four cars then move to the third spot where all parts applied at the second spot are riveted up. At the fourth spot the flooring is applied, hand and air brakes adjusted and tested, end gates put on, card boards and defect card holders applied, hand-brake wheels, and bell cranks are applied. The floor is held to the underframe by 440 ½-in. by 3 ⅝-in. bolts; the holes for which are drilled in the floor by the use of templates and the nuts



The completed car showing the arrangement of the end doors and interior fittings

on the floor bolts are pulled up by the use of impact wrenches. After the floor is laid cement is used around the joints at the car sides. All contacting metal surfaces are coated with car cement as well as the entire underframe.

This completes the work at the four spots inside the shop building. The car is then moved outside to the painting position. A coat of car cement has previously been applied to underframes and interior of car while the cars are inside the shop. Just before the cars leave the shop for the painting position they are thoroughly washed to remove all traces of grease, etc. The painting operations consume four days at the fifth or painting spot position outside the shop. On the first of these four days a coat of red lead is applied. On the second and third days, respectively, the first and second color coats are applied. The fourth day is taken up with stenciling.

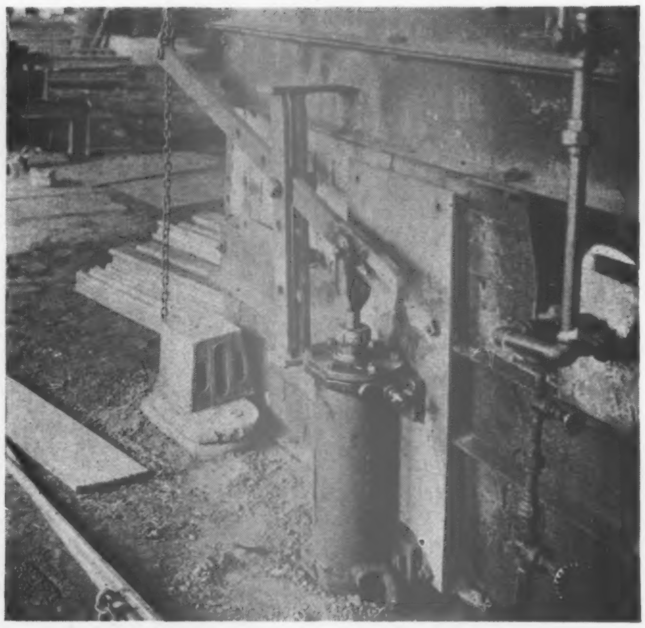
In order to keep the working space between and adjacent to the active tracks on the assembly line clear, a minimum amount of material is placed at the assembly locations. Generally, material of any particular kind is spotted at these locations only in quantities sufficient for eight hours work, these unit-material-supply locations being replenished on the second trick each day.

Air-Operated Furnace Door

By A. Skinner

On a large furnace used to heat heavy forgings, the door was too heavy to be operated by manual labor, and it was necessary to provide some method whereby the door could be operated by power. An ash-pan cylinder was accordingly bolted to a steel plate and both bolted to the side of the furnace, as shown in one of the illustrations.

Referring to this illustration, it will be observed that the fulcrum, made from two pieces of ½-in. by 2-in. flat iron, is supported by two horizontal pieces welded to the top and the bottom and then welded to the side of the furnace. The operating lever has a 1-in. by 6-in.



Ash-pan cylinder used in operating a furnace door

slotted hole in one end, connected to the push rod of the cylinder, and the other end is connected to a chain which passes over two pulleys in front of the furnace and is attached to a U-bolt on the furnace door, as shown in the other illustration.

On the front of the furnace at the top are two 3-in. channels with a 1-in. space between them in which the pulleys revolve. The two vertical angles are welded to the top channels and bolted to castings on the furnace. Two flat pieces welded on either side of the door serve to guide the door while it is being moved up or down.

The operating valve is a ¾-in. straight air valve, located convenient to the operator who can readily raise or lower the furnace door by simply moving the straight air valve handle. It was found after piping the valve that the pressure was too great, so the union under the brake valve was filled with babbitt, faced off smooth and drilled with a ⅜-in. hole which choked the pressure

Heavy furnace door as equipped for air operation

down and enabled the door movement to be more easily controlled. This power-operated door has proved very satisfactory, since it saves considerable manual labor and permits one man to operate the door while charging the furnace.

Preventing Moisture in Double-Pane Windows

Shortly after the New York, New Haven & Hartford placed a number of streamline coaches in service about three years ago some difficulty was experienced with the double pane window sash fogging as a result of the

Fig. 1—Grinding the edges of the glass

accumulation of moisture between the panes. After considerable study the method described in this article was developed by the New Haven mechanical department, in collaboration with the engineering department of the Pittsburgh Plate Glass Co.

The sash used in these de luxe coaches consists of aluminum or stainless steel frames with double panes of high grade polished plate glass set in rubber sealing gaskets. The illustrations show the more important operations and facilities used in preparing the parts and assembling and testing the sash.

The selection of perfect plate glass is of primary importance. This having been done the panes are taken to a cutting table, which is covered with felt, and are cut to a template held to the pane by nine rubber vacuum cups. The cutting is performed in such a manner that the edges of the panes are left with perfectly square corners, without any flaking.

Next, the panes are taken to a grinder where the edges

are ground on an edging wheel with the assistance of water and fine, pure silica sand. This operation is shown in Fig. 1. After grinding, the panes are placed in an adjacent rack for washing. In order that the surface of the panes will not be scratched by any sand remaining from the grinding operation they are washed with a finely-atomized spray of air and water.

The next operation, a most important one, is that of matching pairs of panes in order that the total distance through the two panes and the sealing gaskets will be uniform when placed in the metal sash frame. The panes are measured for thickness, with a micrometer, at four corner locations. The minimum thickness is .237 in. and the maximum is .250 in. After matching the panes are placed on a specially-designed cleaning table shown at the left in Fig. 2. This table consists of a

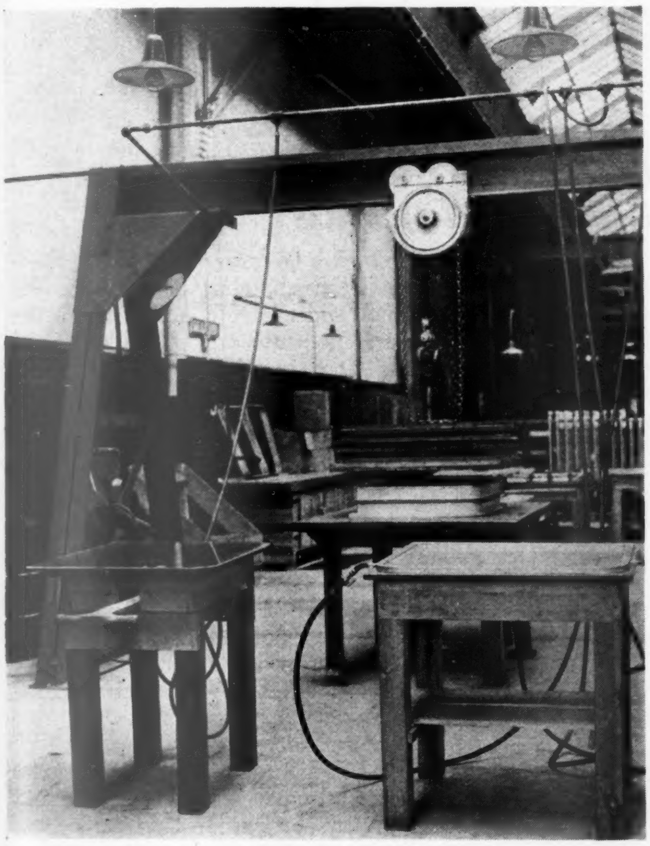


Fig. 2—The section where the panes are cleaned and assembled

felt-padded top with an open center. Within the table is a handling device consisting of an 11-in. diam. vacuum cup on a rotating base. When the polishing of the upper-surface of the pane has been completed, using Bon Ami, the handling device is lifted, by two men, so that the vacuum cup comes in contact with the uncleaned under surface. The vacuum cup is connected to a shop vacuum line, serving this department only, in which a vacuum of about 23 in. is maintained by a small motor-driven pump. By means of the vacuum device the pane of glass is turned over and the other side polished.

The matched pair of polished panes is now ready for assembly in the sash frame. The glass is sealed in the frame by means of rubber gaskets, one around the outside of the glass next to the metal frame and one between the panes. The gasket between the panes is of special rubber of approximately ¼-in. square section and of the same outside dimensions as the pane. In order that this sealing gasket remains flush with the outside edge of the glass it is assembled in a special

Fig. 3—Workman drilling the holes for the corner brackets by means of a jig

frame which has connections to the vacuum line. This frame, by suction, holds the gasket in place while the glass is placed on either side of it. This vacuum frame is shown in the right foreground of Fig. 2.

The next step is to place the panes in the metal sash frame. This is done with the aid of a special holder shown on the table in the background in Fig. 2. A 2,000-lb. weight is brought over the table by the trolley hoist and lowered onto the assembled sash. This weight compresses the sealing gasket between the panes so that the final space between the panes is about .010 in. less than the original thickness of the gasket. The locking section of the metal sash is applied after the compressing operation is finished.

The assembled sash is now placed in the drilling jig, shown in Fig. 3 where the holes for the corner brackets are drilled and tapped. This corner bracket contains two special nipples used for making connection to the nitrogen gas lines used in the dehydrating operation. While

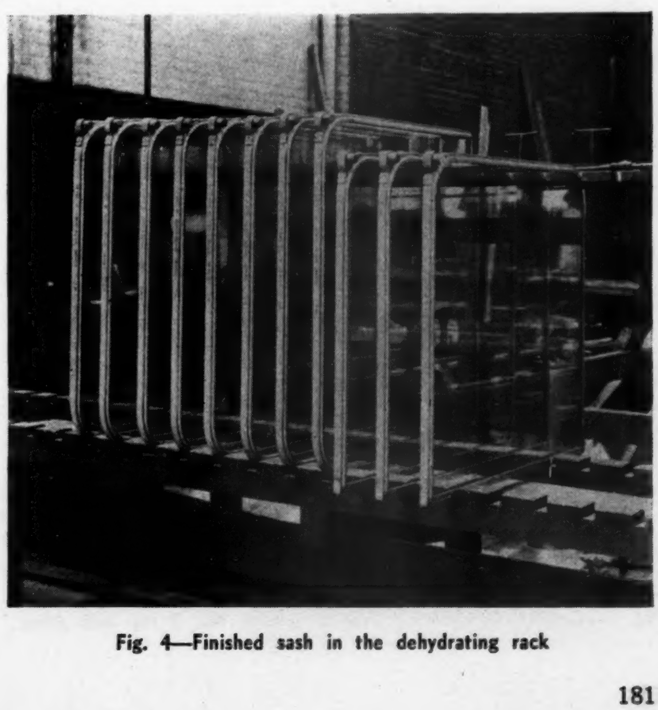


Fig. 4—Finished sash in the dehydrating rack

the sash is in the jig small holes are burned through the rubber separator gasket for these nipples. The corner brackets are applied and the finished sash are placed in the dehydrating rack where nitrogen gas is pumped through the space between the panes for about 12 hours or until frost will not form on the inside of the panes at an outside temperature of 49 deg. below zero. This is determined by applying a Dry Ice pad to the outside of the panes. A special dryer, using activated aluminum, is used in the gas line to remove the moisture. A moisture indicating device is also used so that the test operator may know at all times that the gas is perfectly dry.

After the dehydrating operation is finished a dehydrating cap, filled with activated aluminum, is placed on the corner bracket, over the nipples, to prevent the entrance of moisture into the sash.

Checking Coupler Anti-Creep Feature

In Mechanical Division Circular D.V.-899, recently issued by the secretary, attention is called to the necessity of checking the anti-creep feature of top-operated Type-D couplers and following the proper procedure in cor-

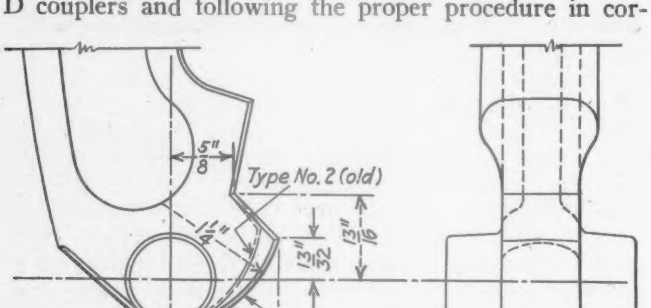


Fig. 1—A.A.R. Type D coupler top lock lifters, new No. 3 type and reclaimed No. 2 type

recting any faulty condition which may be discovered. The following recommendations are made for:

Checking Anti-Creep Feature.—Attempt to lift the lock by pressing downward on a small bar inserted through the front face of the coupler and underneath the lock.

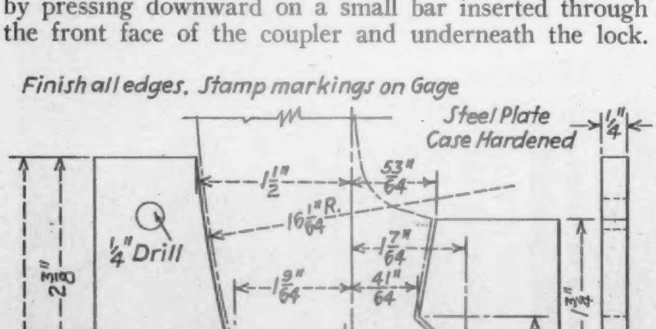


Fig. 2—Gage for reclaiming Type-D coupler No. 2 top lock lifter to No. 3 type

If the lock does not respond to these efforts, the anti-creep feature may be considered to function satisfactorily. If the lock can be lifted by this means sufficiently to release the knuckle, the anti-creep feature does not function properly and should be corrected.

Correcting Ineffective Anti-Creep Condition.—When it is indicated that the anti-creep feature should be improved, it is recommended that a No. 3 Type-D lock lifter, conforming to the design shown in Fig. 1, be applied. If the coupler is fitted with a No. 2 type top lock lifter, this lifter may be reclaimed by building up on the anti-creep ledge to conform with the gage shown as Fig. 2. If the coupler is fitted with No. 1 type of lock lifter, it must be replaced with a new No. 3 lifter or a reclaimed No. 2 lifter.

When a No. 3 or a reclaimed No. 2 top lock lifter has been applied to a coupler, the anti-creep feature should again be tested and the coupler should be fully checked for complete operation.

Questions and Answers On the AB Brake

135—*Q.—Is this downward pressure constant?* A.—No. When the quick-action chamber is charged, the pressure in the emergency slide-valve chamber holds the slide valve to its seat, and pressure on both sides of the strut diaphragm is the same. This has the effect of removing the downward strut pressure, except for the strut spring.

136—*Q.—In full release and charging position, is the brake cylinder connected directly to the retaining valve?* A.—No. It is connected through a passage to the open in-shot valve, from there through passages to cavity *B* in the service slide valve, and through passage *Ex* to the retaining valve.

137—*Q.—How is the in-shot piston volume connected at this time?* A.—Through a port to cavity *K* in the emergency slide valve, thence through a port and passage to cavity *B* in the service slide valve, which is connected to the retaining valve via passage *Ex*.

138—*Q.—What pressures do the spill-over check valve separate?* A.—Emergency-reservoir pressure (above), and the pressure on emergency slide-valve and in the quick-action chamber (beneath).

139—*Q.—In what event do these valves play an important part?* A.—In case the quick-action chamber becomes overcharged.

140—*Q.—When is this likely to occur?* A.—When improper use of the release position of the automatic brake valve is made, and happens on the front end of a long freight train.

141—*Q.—Explain what happens in this event.* A.—When the pressure in the quick-action chamber becomes slightly higher than the emergency-reservoir pressure, the spill-over checks unseat, permitting the overcharge to flow to the emergency reservoir.

142—*Q.—What undesired operation does this movement prevent?* A.—It prevents the quick-action chamber from building up sufficiently to produce an emergency application through the undesired operation of the emergency portion.

143—*Q.—What safeguards are used to prevent the quick-action chamber from being charged from the emergency reservoir?* A.—The use of a spring-loaded check valve and ball check provides double protection against this eventuality.

144—*Q.—What is the state of the accelerated-release*

piston during full release and charging? A.—It is in a balanced position.

145—*Q.—Explain this.* A.—Air from the quick-action chamber is connected through a port in the emergency slide to a passage leading to the left of the accelerated-release piston. Since, the right-hand side of the piston is exposed to the same pressure, the piston is balanced.

Sterling Air-Driven Speed-Bloc Sander

The Sterling Products Company, Detroit, Mich., manufacturer of the Sterling Speed-Bloc Sander, announces a new and improved air-driven model which has been developed through experimental work and practical tests in a large number of plants, using from one to over 150 Sterling sanders regularly in service. The weight of the new model has been reduced from 7½ lb. to 5½ lb. and it is very compact in size, being 7 in. long by 4¾ in. high and 3¾ in. wide.

The Sterling air motor is of patented design, built to close tolerances. Rigid specifications as regards quality of material and workmanship tend to assure continuous trouble-free service and the complete interchangeability of replacement parts required promotes both low maintenance and low operating costs. The machine is said to operate efficiently on 45 to 60 lb. of air pressure.

The cam, fly wheel and connecting rod of the tool are supported on double-shielded ball bearings and all moving parts are of alloy steel, hardened and ground.

For wet work, a water connection is provided for attachment of the water hose. An outlet on either side of the machine directs a spray of water, which is readily adjustable to the job requirement, to the surface being sanded. Re-design of the water outlet protects the workman from getting wet without the use of baffle plates. For work with naphtha, benzine, etc., a special block with Sterlite base is provided which is impervious to volatile compounds.

The principle of "Floating Power," as applied to the construction of the bloc and pad, is an exclusive feature, providing flexibility for sanding and rubbing of curved and flat surfaces. Special pads, varying in flexibility, have been developed for particular types of surfaces and materials. The sanding action is reciprocating, with ⅝-in. travel of the pad, at speeds of 1,750 to 3,000 complete oscillations per minute, dependent upon the application. This movement duplicates the natural back-and-forth action of hand sanding.

This Speed-Bloc sander has many possible uses in railway car shops and, to a somewhat less extent, in locomotive shops where tank exteriors must be sanded as well as many other metal parts. From one to five sheets of abrasives may be attached to the sanding pad at one loading. Ordinary sized sheets are cut into three pieces without waste, each 3⅔ in. by 9 in.

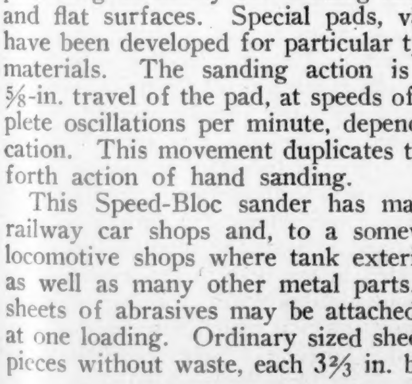
Improved 20-Ton Empty Car Jack

Early in February, Templeton, Kenly & Company, Chicago, started production on an improved 20-ton empty car jack which is shown in the illustration set up ready for jacking a car. This new heavy-duty jack, known as the Simplex No. 2029, is featured by unusual ease of operation, combined with ruggedness and safety. The jack is single-acting with provision for automatically raising or lowering the load, notch by notch. Operation occurs only on the downward or effective stroke of the lever and the rack bar cannot be tripped while under load.

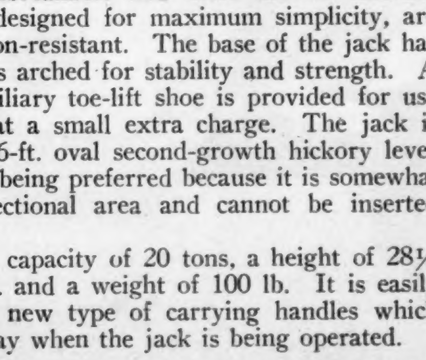
Simplex empty car jack as used in jacking a car

Standard Simplex mechanism, used in the new jack, includes triple tooth pawls and a rack bar made of a heat-treated chrome nickel steel forging. The trunnions are said to be unbreakable and there are no fulcrum pins. All parts, designed for maximum simplicity, are wear- and corrosion-resistant. The base of the jack has a large area and is arched for stability and strength. A 3-in. by 5-in. auxiliary toe-lift shoe is provided for use where necessary at a small extra charge. The jack is furnished with a 6-ft. oval second-growth hickory lever pole, an oval pole being preferred because it is somewhat larger in cross-sectional area and cannot be inserted across the grain.

The jack has a capacity of 20 tons, a height of 28½ in., a lift of 18 in. and a weight of 100 lb. It is easily handled with the new type of carrying handles which drop out of the way when the jack is being operated.



General construction and method of using the improved Sterling air-driven Speed-Bloc sander



IN THE BACK SHOP AND ENGINEHOUSE

An Interesting Method of Setting Valve Gears

As a result of an attempt to adapt the principles of setting Walschaert valve gear described in the December, 1926, issue of the *Railway Mechanical Engineer* to conditions existing in the West Albany shops of the New York Central the supervisors in charge of valve setting at that shop developed a procedure for setting both Walschaert and Baker gears which is different from general practice. After the method was fully developed it was found that valves gave equal steam distribution and permitted setting the valves in a minimum of time and, therefore, it was adopted as standard practice on the New York Central. This method requires that all motion work, with the exception of the eccentric rod, be made to conform to blue print dimensions because the accuracy of the method depends upon maintaining correct dimensions of all valve-gear parts.

In developing the method for setting valve gears, the gear of each class of power was laid out on a drawing in the office of the mechanical engineer, using the correct dimensions of all motion parts. After the gear was laid out, the correct valve travel by crank setting was obtained. Then the eccentric-rod length was determined which would give equal displacement of the valve on each side of its mid-position. Tracings were then made of the Walschaert gear and the Baker gear on which were given instructions for setting the valves, and also the travel of the pin in the link foot, the travel of this pin in front of its mid-position, and the travel of this pin in back of its mid-position, together with other dimensions of motion work taken from standard prints of the two types of valve gears. Tables I and II give these dimensions for one class of power on the New York Central System equipped with Walschaert valve gear, and one class of power equipped with Baker valve gear, respectively. These two classes of power were chosen for inclusion in this article as examples of the tables on the aforementioned tracings, and to illustrate the method of setting valve gears as developed at the West Albany shops.

Fig. 1—Angle plate for locating link to proper back set of foot preparatory to grinding

Setting the Walschaert Valve Gear

Since the accuracy of the method of setting valve gears herein described depends upon restoring all motion work to correct blueprint dimensions, the motion work is delivered to the machine shop where it is inspected, worn parts built up, and all parts are restored to standard dimensions. Radius rods, combination levers, and union links are checked for length and corrected if found in error. The bolt holes in the link body and link cheeks are welded if oversize, and the links are ground to restore the correct back set to the link foot. All link work is done with the aid of a jig; the procedure for using the jig varies slightly, however, depending on whether the link foot is an extension of the link body or an extension of one of the link cheeks.

Consider first a link on which the link foot is an extension of the link body. At the West Albany shops a cone-shaped plug is placed in the link slot, and with this plug in place the link is mounted on the pendulum head of the grinder with a pin extension from the cone plug fitting into a hole in the center of the pendulum head, thus leaving the link free to revolve and to move back and forth on the plug. Another cone-shaped plug with a pin extension is placed in the eccentric-rod-pin hole in the link foot. This pin extension is placed in one of a number of holes drilled in an angle plate, shown in Fig. 1, which is fastened to the bed of the grinder. Each of these holes is for a different class locomotive. When the cone plug is placed in the link-foot hole, but with its pin extension set flush against the face of the angle plate, the link can be revolved and moved on the cone plug in the link slot until the pin extension from the plug in the link foot is opposite the hole in the angle plate which corresponds to the hole for the class of power from which the link was dismantled. The pin extension from the plug in the link-foot hole is then inserted in the hole in the angle plate. With the two cone plugs in position, the link cannot move further and is in a position which assures that the link will be ground with the correct back set of the link foot, the holes in the angle plate being located to give this result. With the two cone plugs holding the link in position, the link is clamped to the pendulum head and the plugs are removed. The link is then ground. Fig. 2 is a view of a link in the process of being ground on the pendulum grinder.

After the link is ground, the link block is fitted and placed in the link slot. The link is then mounted in the jig shown in Fig. 3. This jig has two tapered adjustable rests upon which the link is placed. A pin is inserted in the link block, and bushings representing link trunnions are placed on the pin. These trunnions are bolted

in V slots, leaving the link free to revolve and to move on the link block. A cone plug is placed in the link-foot hole, and a pin is inserted through the cone plug into one of a number of holes in the channel base of the jig, each hole being laid out for a different class of power equipped with Walschaert valve gear. With the trunnion pin and link-foot pin in place, the link cannot move further. The tapered adjustable rests beneath the link are then run up against the underside of the link body and the link is clamped in this position by set screws on the top of the link body. The pin through the link-block hole is then removed and the link-cheek plates are clamped in their proper location central on the link body. If it had been necessary to weld up the link and cheek holes, new holes are laid out according to blueprint dimensions and the jig with the link in place is delivered to the drill press. When the holes are drilled, they are reamed, and fitted bolts are applied. The links and other motion work are then delivered to the erecting floor.

Consider now a link on which the link foot is an extension of one of the link cheeks. After dismantling the link it is placed on the grinder up and ground to blueprint dimensions. After grinding, the link block is fitted and placed in the link jig where the trunnion pin of the link jig is passed through the link-block hole. A setting-up plate with the correct link-foot back set is clamped to the link body, and the cone plug and pin arrangement for the eccentric-rod-pin hole is inserted in the link foot and the hole in the channel base of the jig which corresponds to the class of power from which the link was dismantled. The link body is then set in the jig on the tapered adjustable blocks and the link is locked in this position. The setting-up plate is removed, the cheeks applied, the holes laid out, the holes drilled, and fitted bolts applied as described for the link on which the link foot is an extension of the link body. Fig. 4 shows two of the link jigs on the bed of the drill press with the drilling operation just being started.

After the motion work is delivered to the erecting floor, the valve gang assembles it, places the main driving wheels on rollers, and adjusts the height of the wheel centers as shown by *H* in Fig. 5. Throughout this description of setting Walschaert valve gear, the New York Central System H-5h locomotives will be referred to, the valve-gear and valve-setting dimensions of which are given in Table I.

The port marks, showing the points of admission, are

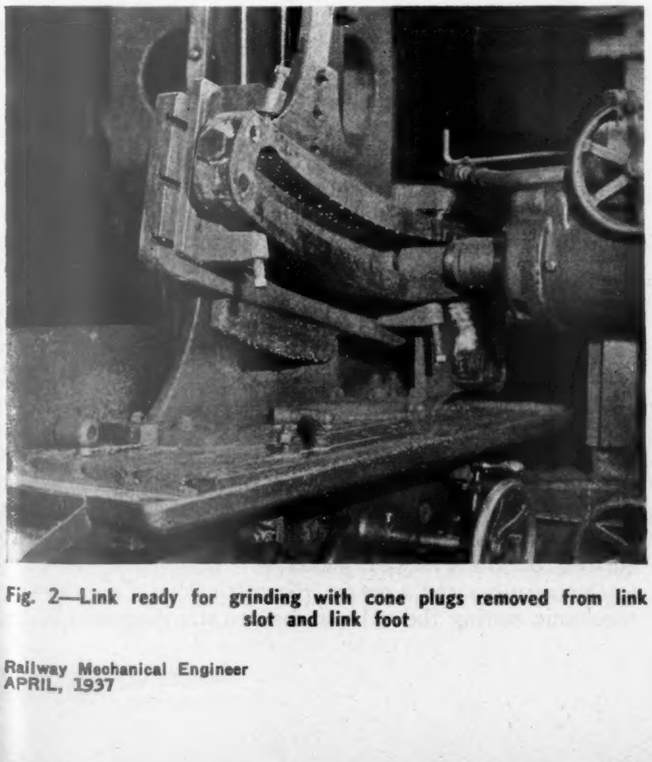


Fig. 2—Link ready for grinding with cone plugs removed from link slot and link foot

scribed on the valve stem on each side of the locomotive. If the distance between the port marks on the right side is not equal to the distance between the port marks on the left side, the valves and ports must be checked to ascertain their correctness as specified in company drawings. When the distances between the port marks on

Table I-Walschaert Valve-Gear and Valve-Setting Dimensions for New York Central H-5h Power

	In.
A—Eccentric-crank length	19¾
B—Link radius	71½
C—Union-link length	24
D—Link-foot travel (total)	23⅛
E—Link-foot travel in front of central position	12⅛
F—Link-foot travel in back of central position	11
G—Eccentric-crank throw	22½
H—Center of axle to top of frame	18¼
I—Valve travel	7
J—Lap	1
K—Lead	⅛
L—Exhaust clearance	..
Main-rod length	125
M—Valve stem made longer due to expansion (when set cold)	$^3/_{64}$

the left and right sides of the locomotive are equal, the striking points of the pistons are obtained and their locations are permanently indicated on the guides by center-punch marks. The main rods, radius bars, and upper end of the combination levers are then connected up. The wheels are then rolled and the extreme travel marks of the crosshead are scribed on the guides by direct ob-

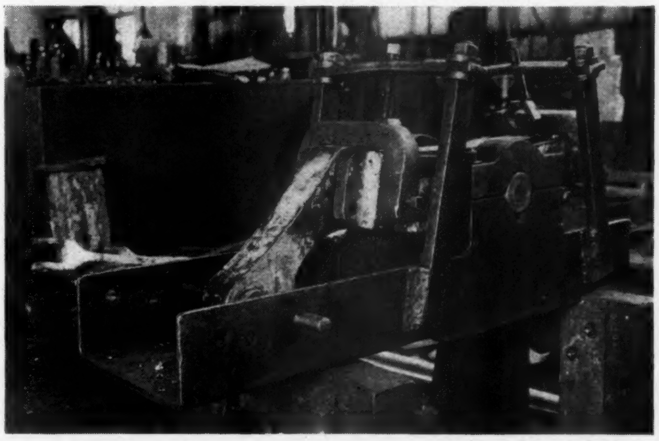


Fig. 3—Link jig with link and link cheeks in position for reaming holes

servation when the piston stops moving, and if it is necessary to adjust the main rod to give equal clearances on both ends of the cylinders, which is required, new travel marks of the crosshead are scribed on the guides. Note that the extreme travel marks of the crossheads are not obtained in the usual manner by stopping the crosshead at some known point ahead of dead center, marking the rim of the main wheel, rolling the wheels until the crosshead goes to dead center and back to the known point ahead of dead center, again marking the rim of the main wheel at this point, and then halving the distance between the marks on the main wheel. With the method of valve setting herein described, this procedure for locating dead centers is not necessary, and, since it is not used, errors in valve movement due to the angularity of the main rod are eliminated. The location of the exact dead centers, eliminating errors due to angularity of the main rods, are obtained by a method which will be described later in this article.

Adjusting the Lift Shaft—The lift shaft on the right side of the locomotive is placed in a position such that the link can be swung the full length of its travel with-

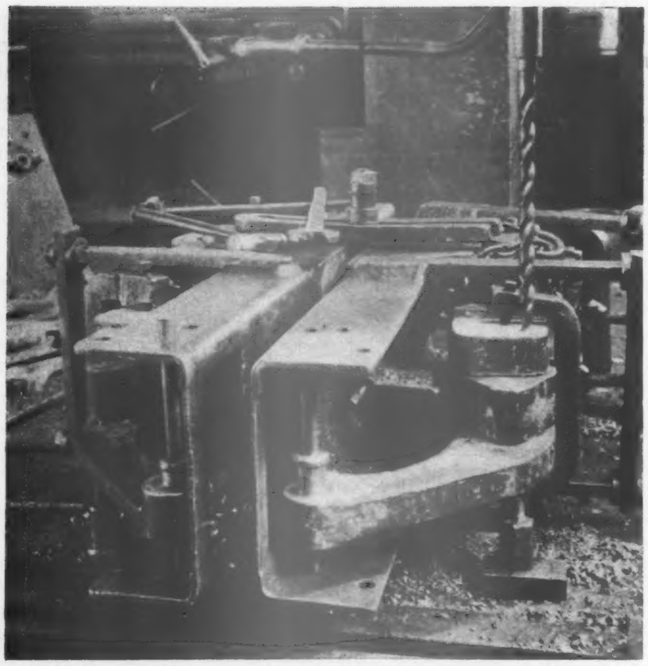


Fig. 4—Link jigs with links in position ready for drilling

out imparting any movement to the radius bar or to the lower end of the combination lever when it is in a vertical position. Without moving the reverse lever, the mechanic goes to the left side of the locomotive and swings the link the full length of its travel. If it is found that the front end of the left radius bar or the lower end of the left combination lever moves, it is evident that the lift-shaft bearings on one side or the other is out of adjustment. If there is movement of the left radius bar or the left combination lever, the mechanic proceeds to make adjustments in the lift-shaft bearings until such movement is eliminated. The lower ends of the combination levers are then coupled to the union links. The location of the valve gear which will impart no movement to radius bars, and therefore the valves, when the link foot is swung through its length of its travel as described in this paragraph, will hereafter be referred to as the mid-position of the valve gear.

Equalizing the Lead—When the valve gear is in mid-position with the eccentric rods connected to the links, and the lower ends of the combination levers coupled to the union links, all movement of the valves is imparted by the combination levers when the wheels are rolled. Each valve will move a distance equal to the sum of the lap plus lead for the head and crank ends of the valve when the wheel is rolled through one revolution. The wheels are rolled until the crossheads are on each travel mark in turn. When a crosshead is on a dead-center position, the valve should be at its extreme travel position and the port should be open an amount equal to the lead, since the valve gear is in mid-position. However, if the valve still moves when the crosshead comes up to any travel mark (which, it will be remembered, was obtained by observation only), the wheels are rolled until the crosshead comes up to and leaves the travel position and when the valve stops moving a line is scribed on the valve stem with the same tram that was used to locate the port marks. The position of a crosshead when the valve stops moving is its exact dead center; the observed crosshead dead-center positions, that is, the travel marks, are checked at this point and the correct travel positions are center punched on the guides. The distances between the port marks on the valve stem and the marks indicating the extreme travel positions of the valves, obtained when the crossheads are on exact dead centers and when the valve gear is in mid-position, are the leads. If the distances between the port marks and the travel marks of the valve, that is, the leads, are not equal for each end of the valve, they are equalized by adjusting the length of the valve stem an amount equal to one half the difference of the distances between the lead and port marks. The valve stem should be left long an amount equal to M given in Table I to allow for expansion. Although M for the class of power used as an example in this description is $\frac{3}{64}$ in., it varies from $\frac{1}{32}$ in. to $\frac{3}{64}$ in. on other classes of power.

Locating the Center of the Link Swing—With the eccentric rods, union links, and main rods all connected, the wheels are rolled until the right crosshead is on its front travel mark. The reverse gear is placed in full-forward position and a line is scribed with the valve tram on the valve stem. The reverse gear is placed in full-reverse position, and a second line is scribed on the valve stem. If the two lines just scribed on the valve stem coincide, the link is obviously in the center of its swing, that is, in its central position. If the two lines do not coincide, the wheels are rolled slowly until the valve tram scribes a line at a point half way between them. The link is then in its central position, and the reverse gear can be moved from full reverse to full forward and back to full reverse without moving the valve. With the link in its central position, and using the center of the eccentric-rod-pin hole in the foot of the link as a center for a long beam tram, a line Z is scribed on the cylinder jacket, as shown in Fig. 5. A line NN is then drawn horizontally on the cylinder jacket as also shown in Fig. 5; this line is located the same height above the rail as the center of the link-foot hole when the link is in its central position.

Determining the Correct Eccentric Throw—In this operation the same beam tram used in locating line Z on the cylinder jacket must be employed. The wheels are

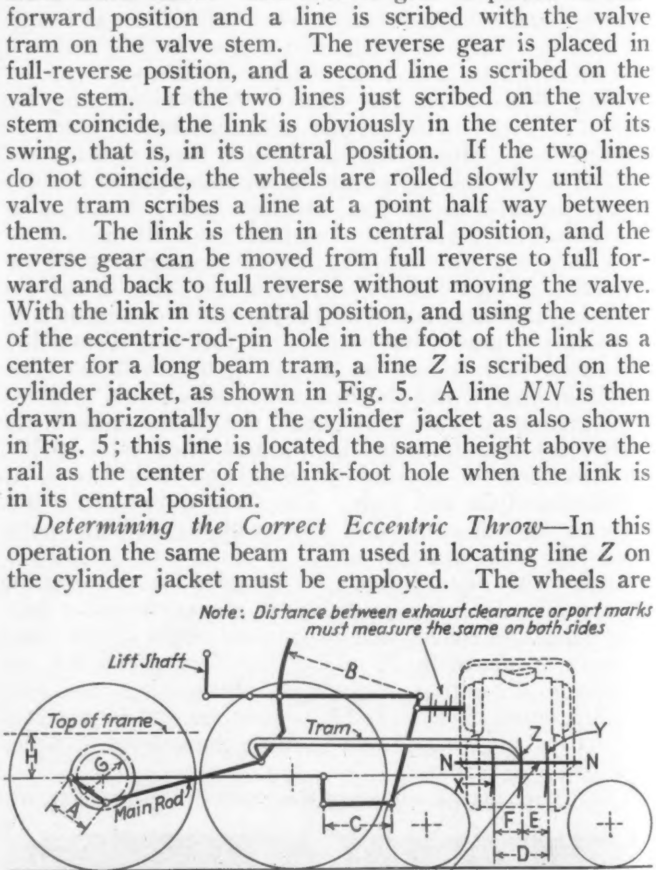


Fig. 5—Walschaert valve gear with link in mid-position—Letters refer to Table I

rolled slowly and the travel marks of the link foot, shown as X and Y on Fig. 5, are scribed on the cylinder jacket. The mechanic setting the valve obtains the correct travel of the link foot from a print of the Walschaert gear layout, which is shown as dimension D in Fig. 5 and given in Table I for H-5h power. If the travel D of the link foot is greater than that called for in Table I, the eccentric crank is moved toward the center of the axle. If the travel D is less than that called for in Table I, the eccentric crank is moved away from the center of the axle. When the dimension D is made equal to blueprint dimensions as given in Table I by adjusting the eccentric crank on the pin as just described, the correct eccentric throw has been obtained and new lines X and Y are scribed on the cylinder jacket.

Determining the Correct Eccentric-Rod Length—The mechanic setting the valve measures the distances E and

F, the link-foot travel in front and in back of the central position of the link swing, respectively, and he checks them with blueprint dimensions as given in Table I for H-5h power. If the dimension *E* is greater than that called for in Table I, it indicates that the eccentric rod is too long by the amount equal to the difference between dimension *E* as obtained on the cylinder jacket and the dimension *E* given in Table I; the eccentric rod is then shortened that amount. The adjustment can also be made by determining the difference between dimension *F* as given in Table I and dimension *F* as obtained from the cylinder jacket. When the eccentric-rod length has been changed, the dimensions *E* and *F* are rechecked, and when they are exactly as given in Table I, the eccentric-rod length is correct.

Adjustment When the Locomotive Is Under Steam—When the locomotive is under steam, the boiler expands, thus necessitating an adjustment of the main reach rod since it was brought to standard blueprint dimensions in the shop. After the engine has been broken in, the lead marks and valve travels are checked and adjustments are made before the locomotive is placed in service.

Setting the Baker Valve Gear

As in the case of setting the Walschaert valve gear, all the motion work when stripped from the locomotive is delivered to the machine shop for restoring parts to blueprint dimensions. After the motion work is delivered to the erecting floor, the valve gang assembles it, obtains the striking points of the pistons, places the main driving wheels on rollers, adjusts the height of the wheel centers as shown by *C* in Fig. 6, and locates the port marks as also shown in Fig. 6. If the distance between the port marks on both sides are not equal, the valve

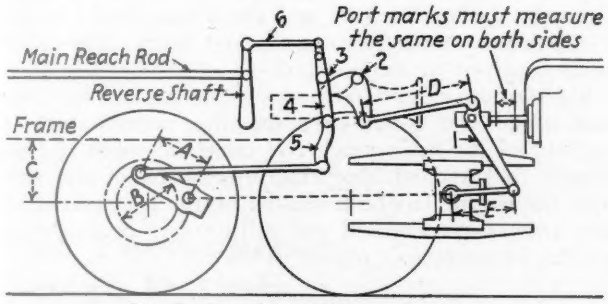


Fig. 6—Assembly of Baker valve gear
(1—Combination lever. 2—Bell crank. 3—Reverse yoke. 4—Radius bar. 5—Gear connecting rod. 6—Gear reach rod. Letters refer to Table II.)

dimensions and port locations are checked for accuracy against the companies drawings. Throughout this description of setting Baker valve gears, the New York Central System L-2 power will be referred to, the valve-gear and valve-setting dimensions of which are given in Table II.

Adjusting the Reverse Yokes—The reverse shaft on the right side of the locomotive is adjusted until it is in a plumb position. The gear reach rod is then adjusted until the distance between the center of the reverse yoke center pin and the center of the bell-crank pin in the frame is equal to *F* shown in Fig. 7 and given in Table II for L-2 power. A tram is used for checking the distance *F*. Leaving the reverse shaft in a plumb position, the mechanic goes to the left side of the locomotive and checks the dimension *F* between the bell-crank pin in the frame and the center reverse-crank pin. If the dimension *F* on both sides are not the same it is evident that the gear reach rod on either one side or the other is out of adjustment. The mechanic then proceeds to make *F* on both sides equal to blueprint dimensions as given in Table II.

Locating the Mid-Position of the Valve Gear in the Erecting Shop—The Baker valve gear cannot be set so there will be no valve movement. However, the mid-position of the gear is obtained by locating the gear to dimension F as shown in Fig. 7. The mid-travel

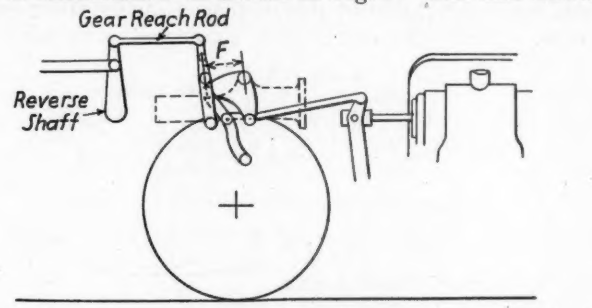


Fig. 7—Position of reverse yoke when gear reach rod is adjusted properly

position of the foot of the gear connecting rod is then obtained as follows:

The main rods, eccentric rods, and union links are connected and the wheels are rolled until the right crosshead is on its front travel mark; as in the case of setting the Walschaert gear all travel marks are first obtained by observation of the crosshead travel and checked for accuracy later. With the crosshead on the right-hand side on its front travel mark, the reverse yoke is placed in its full-forward position, and a line is scribed on the valve stem with the valve tram. The reverse yoke is then placed in its full-reverse position and the valve is again

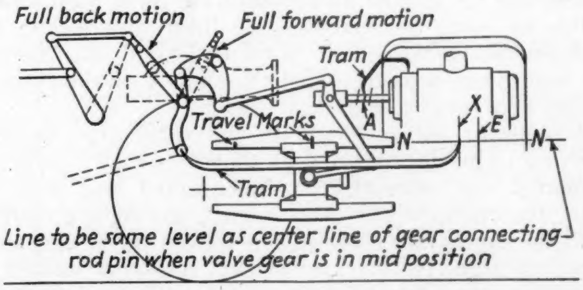


Fig. 8—Baker valve gear set in mid-position

scribed with the valve tram. If the two lines scribed on the valve stem coincide, the gear is in its mid-position. However, if the two lines do not coincide, the wheels are rolled slowly until a line *A*, shown in Fig. 8, is scribed

Table II-Baker Valve-Gear and Valve-Setting Dimensions for New York Central L-2 Power

	In.
A—Eccentric-crank length	$20\frac{1}{8}$
B—Total eccentric-crank throw	$23\frac{1}{2}$
C—Center of driver to top of frame	21
D—Valve-rod length	$54\frac{1}{8}$
E—Union-link length	$26\frac{1}{2}$
F—Center of upper bell-crank pin to center of reverse yoke pin	$16\frac{1}{8}$
G—Travel of foot of gear connecting rod	$23\frac{1}{2}$
H—Travel of foot of gear connecting rod in front of central position	$12\frac{7}{16}$
I—Travel of foot of gear connecting rod in back of central position	$11\frac{1}{16}$
M—Amount valve stem is made longer due to expansion (when set cold)	..
Valve travel	9
Lap	$1\frac{9}{16}$
Lead	$\frac{5}{16}$
Exhaust clearance	..

mid-way between the two lines. This then will locate the mid-position of the gear. With the gear in this position, a tram extending from the center of the eccentric-rod-pin hole in the foot of the gear connecting rod to the cylinder jacket is used to scribe a line *X* on the cylinder jacket as shown in Fig. 8. The gear on the left side is

then run over in a similar manner, to check the mid-position.

Enginehouse Method for Locating the Mid-Position of the Valve Gear—The eccentric rods are disconnected from the foot of the gear connecting rods, and the crosshead on the right-hand side is placed on its front travel mark. With the union link connected and with the

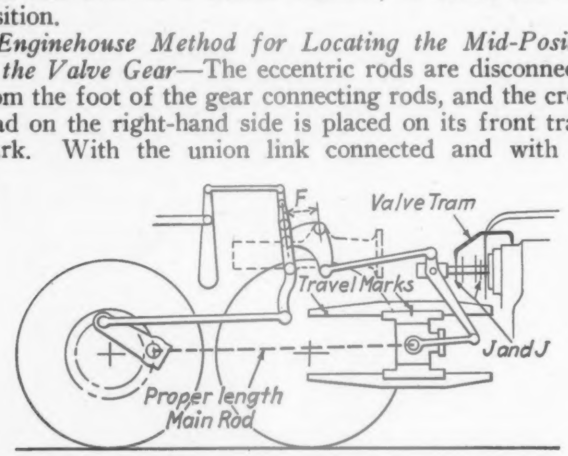


Fig. 9—Baker valve gear in position for adjusting leads

eccentric rod pin temporarily in the hole in foot of the gear connecting rod, the reverse yoke is placed in its full-forward position. One line is then scribed on the valve stem with a valve tram, and another is scribed on the cylinder jacket at *E* with a beam tram extending from the center of the eccentric-rod pin to the cylinder jacket. The reverse yoke is then placed in its full-reverse position and the foot of the gear connecting rod is swung until the beam tram falls on the line *E* previously scribed on the cylinder jacket. A second line is then scribed on the valve stem. The foot of the gear connecting rod is then moved until the valve tram scribes a line mid-way between the two lines; this locates the mid-position of the gear. With the gear in this position the beam tram is used to scribe the line *X* on the cylinder jacket as shown in Fig. 8.

Equalizing the Lead—With the valve gear in mid-position set to dimension *F* as shown in Fig. 9, with the eccentric rod connected or disconnected and with the main rod connected or disconnected, the right crosshead with the union link connected is moved up to and away from the right-front travel mark. A line is scribed on the valve stem when the valve stops moving; the position of the crosshead when the valve stops moving is the exact front dead center and the travel mark previously obtained by observation is checked at this point. The crosshead is then moved up to and away from the back travel mark, and a line is scribed on the valve stem when the valve stops moving; the position of the crosshead when the valve stops moving is the exact back dead center. The lines scribed on the valve stem are the lead marks as shown as *JJ* in Fig. 9. If the distances between the lead marks and the port marks are not the same, the valve stem must be lengthened or shortened accordingly to equalize the leads. The valve stem is left long an amount shown by *M* as shown in Table II to allow for expansion (zero for L-2 power). During this operation the exact dead-center marks are permanently located on the guides by center-punch marks.

Determining the Correct Eccentric Throw—A horizontal line is drawn on the cylinder jacket at the same height above the rail as the center of the hole in the foot of the gear connecting rod. With the reverse yokes set to dimension *F* shown in Fig. 10 and given in Table II for L-2 power, so that the gear is in its mid-position, the wheels are rolled and the travel marks of the foot of the gear connecting rod are scribed with the beam tram on the cylinder jacket at *Y* and *Z* as shown in Fig. 10. If the distance *G* between *Y* and *Z* is equal to *G* as given in Table II, then the eccentric-crank throw is correct. However, if *G* is greater than that given in Table II, the eccentric crank should be moved towards the center of the wheel, and if less the crank should be moved away from the center of the wheel, until the travel *G* shown in Fig. 10 is equal to dimension *G* given in Table II. When this is accomplished, the correct eccentric-crank throw has been obtained, and new lines *Y* and *Z*, indicating the correct distance *G* are drawn on the cylinder jacket.

Determining the Correct Eccentric-Rod Length—After scribing the correct lines *Y* and *Z*, the mechanic measures the distance *H* shown in Fig. 10, and refers to Table II for its correct length. If *H* as measured on the jacket is greater than that given in Table II, the eccentric rod is too long by that amount and it is shortened accordingly. On the other hand, if *H* as measured on the jacket is shorter than that called for in Table II, the eccentric rod is lengthened by an amount equal to their difference. The distance *I* as obtained on the jacket can also be checked against dimension *I* in Table II for obtaining the correct eccentric-rod length.

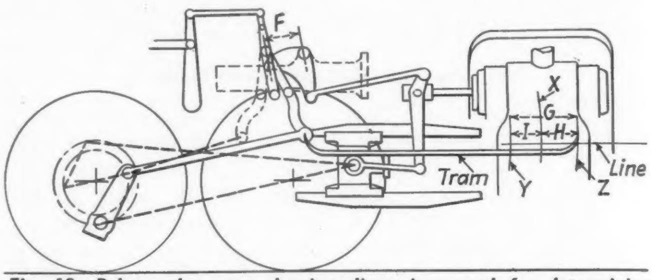


Fig. 10—Baker valve gear showing dimensions used for determining correct eccentric-rod length

After the eccentric-rod length has been changed, the valves are again run over and the dimensions *I* and *H* as obtained on the jacket are checked against the correct values as given in Table II.

Adjustments Under Steam—When the locomotive is under steam the boiler expands, thus necessitating adjustment of the main reach rod since the reach rod was brought to standard blueprint dimensions in the shop. After the engine has been broken in, the lead marks and valve travels are checked and adjusted if necessary before the locomotive is placed in service.

Two-Wheel Truck for Applying Cylinder Heads

An ingenious two-wheel truck arrangement for applying locomotive cylinder heads at the Illinois Central enginehouse, Markham, Ill., is shown in the illustration. It consists of two 12-in. plain truck wheels mounted at one end of a wooden base plank which carries a vertical steel tube and bar construction to support the weight of the cylinder head and a diagonal bar and handle which may be used to give necessary minor adjustments in height of the carrying hook. The use of this device enables relatively heavy cylinder heads to be easily moved about the shop and applied over the cylinder studs.

The base of this truck is made of a 2-in. by 10-in. plank, 6 ft. long, the outer end of which is narrowed to about 6 in. and equipped with a cross-handle for ease of handling. The main vertical supporting member is 4 ft. long and consists of a section of 2-in. flue in the upper end of which is inserted a 1½-in. threaded steel rod the height of which is adjustable by means of a nut. The upper end of this adjusting screw is forged in the form of a clevis with pin connection to the diagonal steel bar,

made of 1-in. by 2½-in. stock and forged to form a hook at the upper end for engagement with the special forged link which is bolted to the cylinder head center lifting stud. The lower end of the diagonal bar is drawn out to form a handle which is held in position against the base plank by means of a bracket and adjustable bolt connection, as shown.

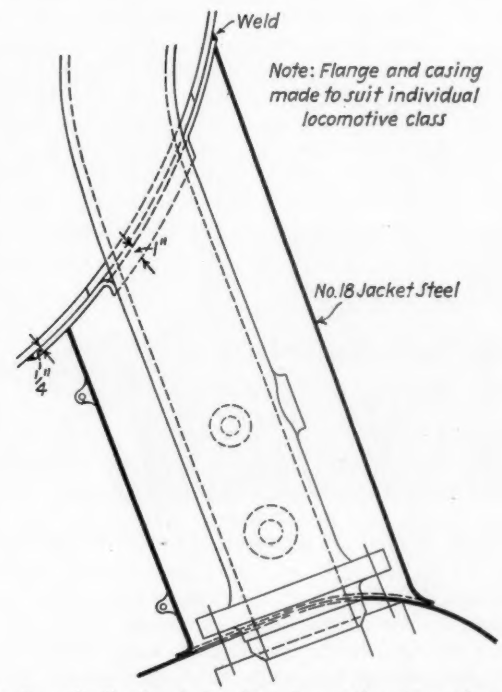
Heavy cylinder heads can be moved easily with this truck

A semi-circular steel plate 12 in. wide by 16 in. in diameter, made of $\frac{3}{16}$-in. stock, is attached near the vertical tube, as shown, and serves to hold the cylinder head vertical when applying it over the cylinder studs. In operation, this device may be readily used to lift the cylinder head from the floor and move it into position in front of the cylinder where any necessary adjustment for height may be made and the cylinder head easily applied over the studs.

Two Locomotive Design Details

Two improved details of locomotive design which have given unusually good results on the Indiana Harbor Belt are shown in the illustration, comprising a steam-pipe casing and a cover plate for grate connection rods.

The steam-pipe casing forms an air-tight joint, where each steam pipe passes through the smokebox sheet, by means of a simple design which can be easily applied at small expense. The casing consists simply of a pressed-steel flange fitted accurately around the steam pipe and welded to the smokebox, with the usual cylindrical jacket extending down to the steam chest. The flange, formed of ¼-in. steel, is, of course, made in two pieces for application around the steam pipe, the joint being electrically welded. Also, the outer edge of the flange is electrically welded to the smokebox.

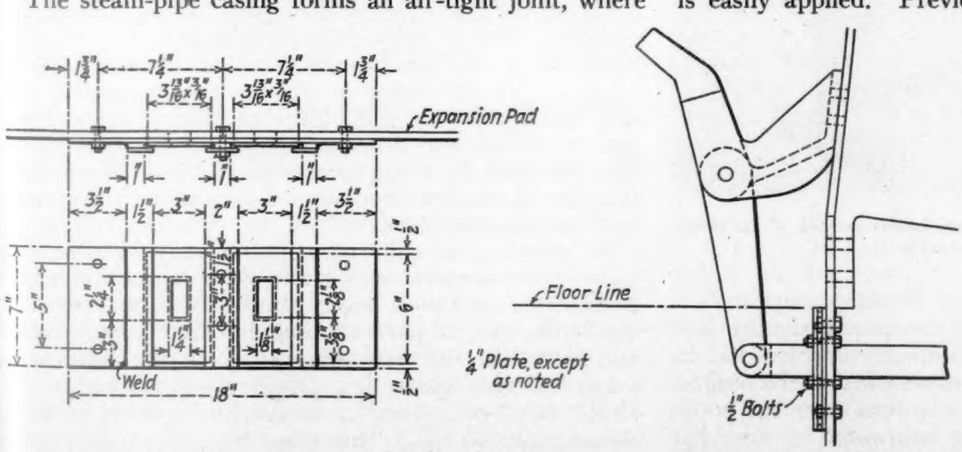


Simple and effective design for a locomotive steam-pipe casing

The jacket made of No. 18 gage steel, is cut to the proper shape and applied in one piece around the steam pipe, after the latter is insulated with a thick coat of plastic asbestos. The two edges of the jacket joint are held together by bolts through two lugs.

Since the flange is welded in place, it must be cut away in order to remove the steam pipe, and generally cannot be used again. Since steam pipes have to be taken out at only infrequent intervals, however, and in view of the relatively small difficulty and cost of applying new flanges, this feature does not constitute a serious objection to the use of the steam pipe casing design described.

The type of cover plate for grate-connecting rods now used as standard on Indiana Harbor Belt locomotives, is easily applied. Previous to the development of this design, small sheet metal cinder boxes were applied to the outside of the rear waste sheet just below the cab floor, designed to catch live cinders which might otherwise work out of the firebox when the grate shaker



Sliding cover plate design for locomotive grate connection rods

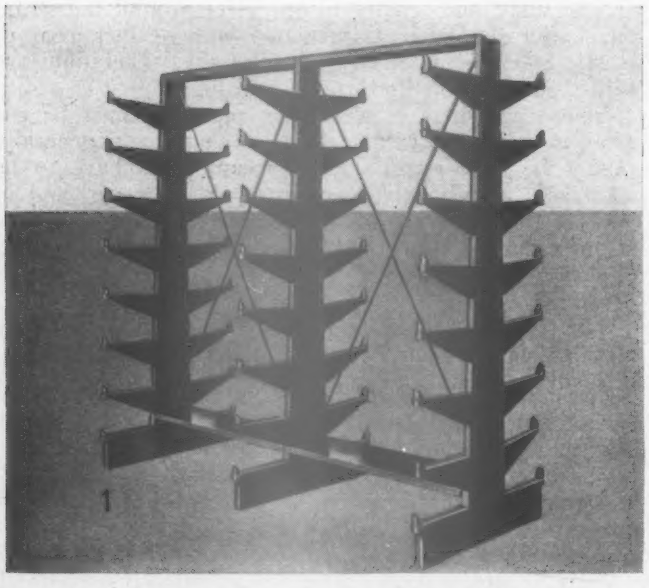
levers are operated, and thus cause a fire hazard. The difficulty with these cinder boxes is that they may become filled with wet or damp cinders in the winter time and freeze, preventing operation of the grate shaker levers.

In the design illustrated, a small rectangular plate, made of ¼-in. steel, 6 in. long by 3 in. wide, is provided with a 2½-in. by 1⅛-in. hole just large enough to fit around the grate rod. This plate is allowed to move vertically as much as may be required during operation of the grate shaker lever, by sliding in suitable guides welded to a back plate which is bolted to the rear waste sheet, or expansion pad, as it is sometimes called. These cover plates effectively close the openings where the grate rods pass through the waste sheet and prevent the emission of live cinders.

Rack for Storing Steel Bars

The steel bar rack, illustrated, is made by Lyon Metal Products, Incorporated, Aurora, Ill., and adaptable for a variety of purposes in railroad shops as well as manufacturing plants and storehouses. The rack is available in either the single- or double-face type, in two standard heights, 79 in. and 97 in., and an upright spacing of 36 in. or 48 in. The cantilever arms, on which the pipes and rods may be stored, are 12 in. long and adjustable on 3-in. centers. If the storage of long, bulky items is desired, shelves can be easily placed on these arms and material or merchandise of unusual length that must be conveniently stored flat will be kept in good condition.

The bar rack is of sturdy construction, finished in



Lyons double-face steel rack for the convenient storage of bar stock and other materials

green baked enamel. It is made of heavy gage steel in channel and L-shapes to give necessary rigidity and strength. The weight-carrying capacity is somewhat indefinite and depends more or less on whether the weights are concentrated in one spot or spread over the entire rack. Each upright rests on a base piece or floor bar which is 31½ in. long on a double-face rack. A compression shelf ties the uprights together at the top and there is also a compression shelf at the bottom. The rack is stiffened against side sway by means of brace rods, as shown in the illustration. The cantilever arms are secured to the uprights by locking them in suitable slots, and they are therefore readily adjustable for varied spacing to meet the requirements of different kinds of materials being stored.

How to Recondition Water-Soaked Tools

The more or less frequent recurrence of flood conditions in various parts of the United States has led the Black & Decker Manufacturing Company, Towson, Md., to issue instructions for the reconditioning of water-soaked electric tools, which are of general interest. In most cases, submersion practically ruins the insulation in the tools as well as rendering the fibre parts unfit for use, diluting and contaminating the grease and covering all parts with silt and mud. Obviously, these tools should not be operated until after having been thoroughly reconditioned, preferably by the manufacturer.

In cases where the owner desires to service the tools at local shop points, the following procedure is suggested: Completely disassemble each tool so as to get at all parts. The armature and field should be baked for 24 hr. at a temperature of 275 deg. F., then being checked for short and grounds, a coat of insulating compound applied and the parts again baked for 12 hr. at 275 deg. F. All fibre switch and brush riggings should be replaced. Most switches will have to be replaced and all taped wire connections should be cleaned and retaped. Clean all ventilating holes in the case of the tool. Wash all grease from gears, housings and bearings, using a suitable fluid, and repack with new lubricant, comprising a good grade of medium cup grease. Clean rust and dirt from all parts.

These instructions apply to electric grinders, both the portable and bench type, sanders, polishers, drills, screw drivers, hammers, saws, valve refacers and most types of motor-driven electric tools.

Reconditioning Tools at Paducah Shops

Electrical equipment submerged at the Paducah, Ky., shops of the Illinois Central, as referred to in an editorial elsewhere in this issue, comprised approximately 525 electric motors which were subjected to flood water and required baking out. One of three different processes was used, dependent upon conditions. The first was removing the motor from the machine, placing it in a baking furnace where the temperature was maintained at 220 to 240 deg. F. and the time required ranging from 18 to 48 hr. for each motor, depending upon the type of winding. In the drying of other motors, a paraffin bath was used, while on still others an electric current was passed through the motor windings, the temperature being governed by voltage control. Each of these three processes produced the desired results under the particular conditions involved.

As stated in the editorial, approximately 550 shop machines and furnaces were under water and required attention, the machines being completely disassembled in most instances, all parts thoroughly cleaned, reassembled and provided with new lubricants. In the cleaning of heavy machine parts, the dipping process was extensively employed, using a solution of caustic cleaning compound, No. 5-B, furnished by the International Chemical Company, Philadelphia. Most of the small tools, not heavily coated with grease, were dipped in a bath of Oakite No. 32, and serving principally as a rust remover. The tools were then rinsed in plain water,

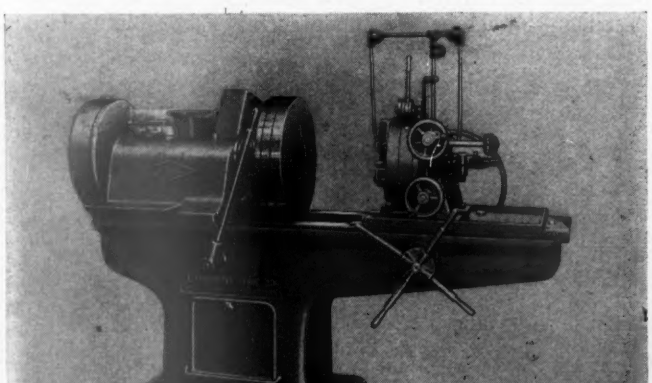
dipped in a bath of boiling Oakite No. 24, and finally immersed in an oil bath. In the case of small tools, heavily coated with grease, the first process was boiling in a bath of Oakite No. 24, then returning to the regular procedure already described. The use of this method of cleaning shop machinery and tools proved very effective and permitted reconditioning a large number of tools in record time.

Pipe Threading And Cutting Machine

The Landis Machine Company, Inc., of Waynesboro, Pa., has redesigned its 2-in. pipe threading and cutting machine, which is furnished with either motor or belt drive, and equipped it with an eight-speed built-in gear box with single-pulley drive. For a motor-driven machine the motor is mounted on top of the headstock and connected to the main drive shaft by a silent chain drive. The chuck speeds available are 30, 40, 52, 67, 72, 90, 125, and 163 r.p.m. The speed of the main drive shaft is 425 r.p.m.

The ways of the redesigned machine are covered by steel guards which are attached to the cross rail and are telescoped under the headstock in order to protect the ways at all times. Although the redesigned unit now weighs slightly more than the machine which it replaces, because the bed has been made heavier and stronger by increasing the thickness and number of the webs and ties, it requires practically the same floor space as the old machine.

A gear box very similar to the one used on the old 2-in. threading machine is employed on this machine.



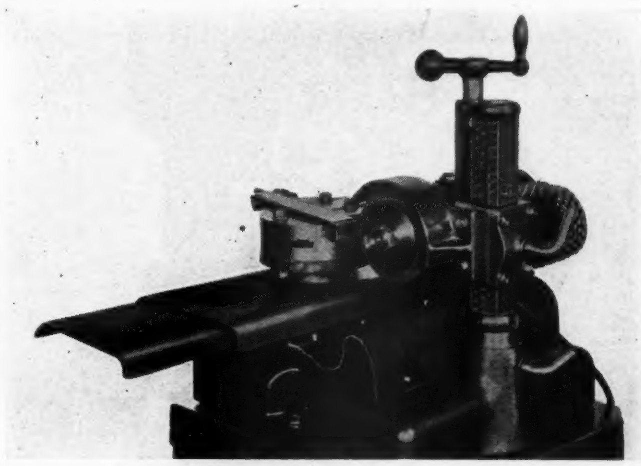
The redesigned Landis 2-in. pipe-threading and cutting machine

The speed-change gears are all made of chrome nickel steel, are hardened and burnished, and run in oil. All gears are mounted on antifriction bearings on heat-treated shafts.

The headstock is set directly on the bed instead of on raising strips as on the old machine. No changes have been made in the die head, cross rail, cutting off attachment, and chucks. This machine has a capacity for threading pipe from ½ in. to 2 in., inclusive; it has a carriage travel of 14 in., and requires floor space 3 ft. 7 in. wide by 6 ft. 8½ in. long. The belt-driven machine weighs 2,800 lb. net. The motor-driven machine weighs 3,000 lb. net and is powered with a 3-hp. a.c. or d.c. motor which runs at an approximate speed of 1,200 r.p.m.

Grinder for Threading Dies and Chasers

In the illustration is shown a grinder for threading dies and chasers of all kinds. It is equipped with a fixture and wheel for each type of chaser to be ground, together with a micrometer adjustments for grinding cutting edges and leads. A thin wheel also is furnished for grinding out broken teeth. This unit is called the "Tom Thumb" chaser grinder and is manufactured by the Oster Manufacturing Company, Cleveland, Ohio. Standard equipment with the grinder consists of one set of fixtures and wheels for grinding any one type of chaser, a ¼-hp. Universal motor, and a dressing stick for grinding wheels. The base of the unit is 13 in. square and it is 17½ in. high. It weighs approximately 125 lb. A welded steel stand with a built-in shelf for extra fixtures can be furnished as an extra for mounting the grinder.



The Tom Thumb Oster grinder for dies and chasers

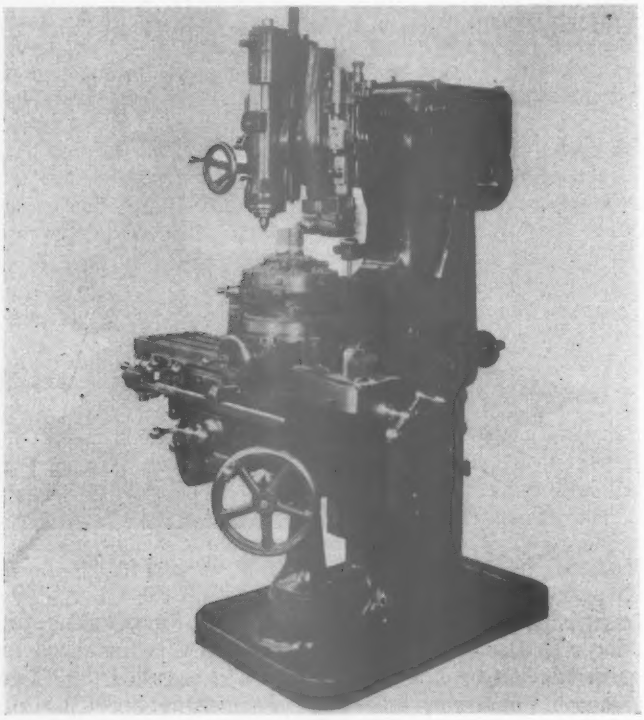
Universal Vertical Miller-Shaper

Improvements have recently been made on the Colby Universal vertical milling and shaping machine shown in the illustration. The machine has been provided with a high-speed spindle mounted in antifriction bearings, and has ten right-hand speeds, the maximum of which is approximately 2,100 r.p.m. The spindle is equipped with a sleeve to hold ⅛-in. to ⅝-in. split collets, thus eliminating the need for a high-speed attachment. This spindle can be furnished either with or without power down feed with four changes applicable to any spindle speed. The feed has an automatic stop and a micrometer screw for gaging depth.

A radius tool attachment is furnished with the machine which fits the shaper ram in place of the clapper block, and will shape punches from the rough without undercutting. A punch located on the compound circular table can be machined on all sides, developing, from any center within a 5-in. circle, true radii, tangent and angular cuts. These table settings can be duplicated when machining the die opening with a regular tool holder. The accuracy obtained results, on many dies and punches, in a large saving of transfer and set-up time, and in filing and fitting.

The milling and shaping heads adjust at any angle

right to left, or left to right from vertical to horizontal and 45 deg. front and back from center for drilling, millings, boring, shaping and slotting operations with constant power feed for milling, and intermittent feed for



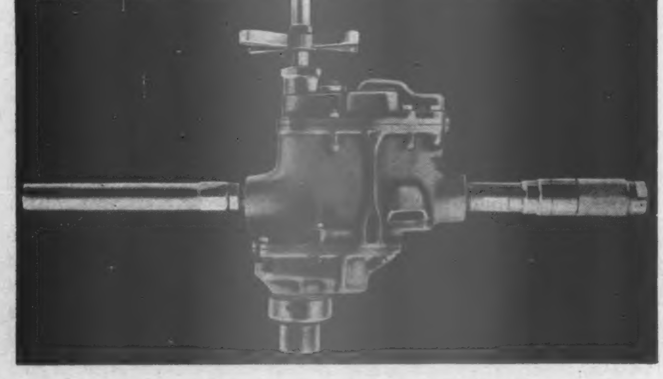
A Universal miller-shaper adaptable for work previously limited to horizontal-spindle machines

shaping. These adjustments apply to all longitudinal, transverse, and circular table movements.

The table can be arranged to receive a 10-in. Universal dividing head. Spiral gears, milling cutters, and a variety of other work on centers formerly limited to horizontal spindle type machines can be done on this Universal vertical machine. The machine and attachments are built by the Cochrane-Bly Co., Rochester, N. Y.

Rotor Non-Reversible Air Drill

A non-reversible rotor-type air drill with a multi-port governor which controls the free speed, thus preventing burning of drills and reamers and at the same time reducing the air consumption, has been announced by the Rotor Air Tool Company, Cleveland, Ohio. The



The Rotor light-weight air drill

drill is made in two models. The E-73 model operates at speeds of 450 and 300 r.p.m. for drilling capacities of 29/32 in. and 1¼ in., and reaming capacities of 13/16 in. and 1 in., respectively. The other model, designated as the E-72 drill, operates at 450 r.p.m. and has 29/32 in. and 13/16 in. drilling and reaming capacities, respectively. Both models weigh 22 lb. and have an overall length of 13¼ in., including the grip handles. The distance from the side to the center of the spindle is 1⅞ in. on both models. They are furnished with a heavy-duty screw feed of 4 in. travel. The cylinder housing and gear case are made of heat-treated aluminum alloy with rib reinforcements.

Emergency Clamp For Pipe

Emergency and, in some cases, permanent repairs to leaky pipe lines conveying steam, water, gas, oil, ammonia or brine are readily made by means of various types of special pipe clamps manufactured by the M. B. Skinner Company, South Bend, Ind. Only one of these clamps is shown in the illustration, consisting of a malleable iron cylinder, halved, hinged along one side and fitted with bolts on the other, a gasket of suitable material being inserted over the crack in the pipe. This type of clamp is very easily applied when a leak develops. Owing to the long open hinge, the two halves of the clamp may be slid together along the pipe when space is limited, and a small wrench can be used to tighten the nuts on the bolts, which are cadmium plated.

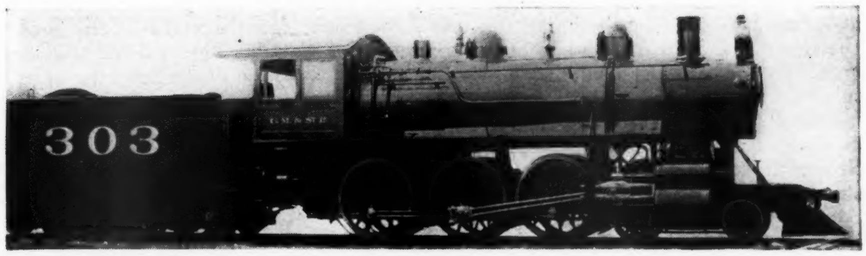
Due to the small area of average pin hole or corrosion leaks, the Skinner pipe clamp is said to stop the leak regardless of pressure. The clamp is also a safety feature and may be carried in stock in all sizes as an insurance against leakage. The clamp comes complete with a

Skinner clamp for permanently stopping pipe leaks

gasket, but if other gasket material is required, it should be cut to the same dimensions, for a gasket cut too large diffuses the pressure. It is by concentration of pressure on the leak that this clamp makes a positive, permanent repair.

This general type of Skinner pipe clamp is available in other detail designs such as an extended pipe-line clamp, a pipe-joint clamp which may be readily applied next to a fitting, a collar-leak clamp, a bell-joint clamp a split-coupling clamp, a high-pressure-weld clamp and various types of band and saddle clamps.

The Metamorphosis of a Steam Locomotive on the Milwaukee



Above: One of 25 Baldwin-built Vauclain compounds delivered to the Milwaukee in 1900—Left: The locomotive as equipped with a larger superheated-steam boiler, simple cylinders and outside valve gear in 1926—Below: A locomotive of the same class equipped with a specially decorated streamline housing (but otherwise unchanged) and now used to haul a section of the Hiawatha over a secondary line in Wisconsin

NEWS

Santa Fe's Chief To Be Streamline

PLANS have been completed by the Atchison, Topeka & Santa Fe for the conversion of its Chief, operating between Chicago and Los Angeles, Calif., to a lightweight, streamline train, by the introduction of new Pullman cars, and new coaches, club cars and dining cars. Each of the six units of the ten-car train comprising the new Chief will consist of a club-baggage car, a club-lounge car and a dining car, which are now being built by the Edward G. Budd Manufacturing Company for the Santa Fe, and an observation, four-drawing room, double bedroom sleeping car; a 14-section sleeping car; an 18-roomette sleeping car; 2 two-drawing room, two-compartment, four double-bedroom sleeping cars; and 2 eight-section, two-compartment, two-double bedroom sleeping cars.

In addition, four additional dining cars and three additional sleeping cars will be included in the pool, making the total number of cars 67. The 45 sleeping cars will be constructed by the Pullman-Standard Car Manufacturing Company for the Pullman Company, while the remaining 22 cars are a portion of the 52 cars ordered by the Santa Fe from the Edward G. Budd Manufacturing Company. These 45 Pullman cars contain new features not found at present in standard sleeping cars. The drawing rooms and compartments are designed for added room and comfort, with a different layout. The roomette car is a new type, containing 18 separate, individu-

* * *

ally enclosed roomettes designed for one passenger, and containing a folding bed-type berth, washstand, toilet and wardrobe.

Thirty of the cars ordered from Budd, all coaches, will be placed in service on the Scout, the Santa Fe's all-coach tourist-sleeping car operating between Chicago and San Francisco, Calif., and Los Angeles.

Southern Pacific Locomotives—A Correction

THE Franklin Railway Supply Company, New York, furnished the boosters on the Southern Pacific 4-8-4 type locomotives described in the March issue of the *Railway Mechanical Engineer*. The company is incorrectly given in the list of specialties on page 105.

Diesel Locomotive Repair Costs—A Correction

IN the publication of the article entitled "Diesel-Electric Locomotive Projected Repair Costs" which appeared on page 111 of the March issue reference was omitted of the fact that the article was an abstract of a report prepared for the Northampton & Bath by John P. Kivlen, engineer maintenance of way and equipment.

Missouri Pacific Plans New Enginehouse

THE Missouri Pacific is contemplating the construction of an eight-stall frame enginehouse at Atchison, Kan., to replace an existing structure, at a total estimated cost of about $114,000. The work will involve considerable revision of the terminal track layout to accommodate the new house and to secure greater economy in the operation of the terminal.

President Appoints Locomotive Bureau Official

PRESIDENT ROOSEVELT has appointed Allyn C. Breed assistant chief inspector of the Bureau of Locomotive Inspection of the Interstate Commerce Commission and has sent his name to the Senate for confirmation. Mr. Breed was the senior inspector in point of service in the bureau, having come with the commission on August 10, 1911. He takes the place of John A. Shirley, who was retired.

New "Century" and "Broadway" Planned

NEW streamline equipment and expedited schedules for the New York Central's "Twentieth Century Limited" and the Pennsylvania's "Broadway Limited" were forecast in a joint statement issued by those two roads on March 9. These two trains, on which a charge of $7.50 in addition to the New York-Chicago fare is now assessed, make the run between those cities in 16½ hrs.; and the statement says that "a quickening of passenger schedules" in this service is contemplated.

Staff engineers of the two roads and industrial engineers are collaborating in the design and construction of entirely new equipment for the trains. The program also contemplates a general improvement in and the extension of the new type of equipment to certain other principal services between eastern and western terminals of the two roads.

"The new equipment" the statement con-
(*Continued on next left-hand page*)

New Equipment Orders and Inquiries Announced Since the Closing of the March issue

Locomotive Orders

Road	No. of locos.	Type of loco.	Builder
A. T. & S. F.	1 [1]	3,600-hp. Diesel-elec.	Electro-Motive Corp.
C. W. Pullman & Sou.	2	0-6-0	Baldwin Locomotive Works
Lehigh Valley	10	Loco. tenders [2]	American Locomotive Co.
Mo. Pac.	4	600-hp. Diesel-elec.	Electro Motive Corp.
	2	900-hp. Diesel-elec.	
Nor. Pac.	11 [3]	4-8-4	Baldwin Locomotive Works
	6 [3]	4-6-6-4	American Locomotive Co.
St. L.-S. W.	5	4-8-4	Company shops
Youngstown & Northern	2	900-hp. Diesel-elec.	American Locomotive Co.
	2	900-hp. Diesel-elec.	Electro-Motive Corp.

Locomotive Inquiries

Road	No. of locos.	Type of loco.	Builder
Grt. Western	1	Lt. wt. 2-8-0	....
	1	Heavy wt. 2-8-0	....
M. St. P. & S. Ste. Marie	4	4-8-4	....
Nat'l Rys. of Mexico	10	4-6-2	....
	8	2-6-6-2	....
Seaboard Air Line	10	Loco. tenders	....

Freight-Car Orders

Road	No. of cars	Type of car	Builder
D. M. & N.	500	Ore	General American Trans. Co.
D. T. & I.	400	Box	Greenville Steel Car Co.
	350	Auto.	Bethlehem Steel Co.
Central of Georgia	500	50-ton box	Pullman-Standard Car Mfg. Co.
	100	50-ton auto.-furn.	American Car & Foundry Co.
G. T. W.	100	70-ton gondola	Magor Car Corp.
	100	Refrig.	Pullman-Standard Car Mfg. Co.
	200	Auto.	Pullman-Standard Car Mfg. Co.
Michigan Limestone & Chemical Co.	15	30-cu. yd. air dump	Austin-Western Road Machy. Co.
	15	30-cu. yd. air dump	Differential Steel Car Co.
M., St. P. & S. Ste. M.	100	Ballast	American Car & Fdry. Co.
M-K-T	50	70-ton Hart selective ballast	American Car & Foundry Co.
Nor. Pac.	750	50-ton gondola	Pressed Steel Car Co.
	250	70-ton gondola	American Car & Foundry Co.
	500	50-ton flat	Bethlehem Steel Co.
	500	Box	Pacific Car & Foundry Co.
N. & W.	1,000 [4]	Hopper coal	Virginia Bridge Co.
	1,000 [4]	Hopper coal	Bethlehem Steel Co.

Freight-Car Inquiries

Road	No. of cars	Type of car	Builder
A. C. L.	100-400	50-ton box	....
	100	50-ton auto. with loaders	....
	100	50-ton auto.	....
	100	70-ton phosphate	....
C. N. O. & T. P.	2,500	40-ton box	....
	500	40-ton auto.	....
	1,100	50-ton hopper	....
	1,250	50-ton gondola (high side)	....
	250	50-ton gondola (low side)	....
L. & N. E.	100	70-ton gondola	....
	100	70-ton covered hopper cement	....
M. St. P. & S. Ste. Marie	250-350	50-ft. box	....
	100	40-ft. box	....
	100	Hopper	....
	100	General service	....
	100	Ballast	....
Pennsylvania	1,000	Box	....
	1,500	Gondola	....
	300	Covered hopper cement	....

Passenger-Car Orders

Road	No. of cars	Type of car	Builder
A. T. & S. F.	30 [5]	De luxe coaches	Edward G. Budd Mfg. Co.
	10 [5]	Diners	Edward G. Budd Mfg. Co.
	6 [5]	Club-lounge	Edward G. Budd Mfg. Co.
	6 [5]	Club-baggage	Edward G. Budd Mfg. Co.
Can. Pac.	21	First-class coaches	See footnote [6]
	1	Coach	See footnote [6]
	1	Cafe-parlor	See footnote [6]
	2	Bagg.-exp.	National Steel Car Corp.
	5	Mail-exp.	National Steel Car Corp.
Central of Georgia	5	Coaches	Bethlehem Steel Co.
	3	Express	Bethlehem Steel Co.
Erie	80	Milk	Greenville Steel Car Co.
Grt. Nor.	12	Coaches	Pullman-Standard Car Mfg. Co.
N. Y. N. H. & H.	50 [7]	Coaches	Pullman-Standard Car Mfg. Co.
	5 [7]	Cafeteria	Pullman-Standard Car Mfg. Co.
N. & W.	9	Postal	Bethlehem Steel Co.
St. L.-S. W.	10	Air-conditioned coaches	Pullman-Standard Car Mfg. Co.

Passenger-Car Inquiries

Road	No. of cars	Type of car	Builder
A. C. L.	15	Coaches	....
	15	Express	....

[1] The locomotive will be used to haul the nine light-weight streamline passenger cars now being constructed to replace the present equipment of the Super Chief this spring between Chicago and Los Angeles, Calif.

[2] The tenders will have a capacity of 30 tons of coal and 20,000 gal. of water.

[3] Eight of the 4-8-4 type are for the Northern Pacific. The remaining three 4-8-4's and the six 4-6-6-4 type are for the Spokane, Portland & Seattle. The 17 locomotives are in addition to the order for nine 4-6-6-4's reported in the February issue.

[4] In addition to previous orders for 1,000 cars each placed with these companies.

[5] To be of stainless-steel, streamline construction.

[6] Frames to be built by National Steel Car Corporation and cars finished at Angus shops of the Canadian Pacific.

[7] Permission to purchase this equipment granted by the Court. The coaches will be duplicates of the 50 purchased in 1934 and the 50 additional in 1936. The five cafeteria cars will be duplicates in structure and appearance of the passenger cars, but with different interiors. They will have a self-service counter and bar and will be provided with chairs and tables for serving food and drink.

F O R E S I G H T !

Foresight in railroad operation correctly gauges the traffic volume and needs, and provides equipment, at the lowest economic cost, to meet these requirements.

The present trend is for higher speeds with heavier train loads. Modern power is needed to provide the necessary horsepower capacity to haul such trains at economical costs.

Fortunately, the modern locomotive, of improved design, is capable of delivering 25% to 40% increase in horsepower capacity without increase in driving wheel loads. Expensive changes in track and bridges are not necessary for its operation.

LIMA LOCOMOTIVE WORKS, LIMA LOCOMOTIVE WORKS INCORPORATED INCORPORATED, LIMA, OHIO

tinues, "will mark a distinct departure from that now in service." It will include lounge, sleeping and observation cars, to be built by the Pullman Company in accordance with designs now being worked out in cooperation with the two roads.

Both the Pennsylvania and New York Central, the statement further reveals, have been experimenting with modernistic equipment and also have been studying new types of equipment, which have been in operation in other territories, with a view to adopting designs suitable to the service requirements and operating conditions on their respective systems.

Diesel "Firemen" Get Jobs Insured

An agreement governing the employment of firemen (helpers) on Diesel-electric, other internal-combustion and steam-electric locomotives was reached in a joint conference committee of managers, representing most of the principal railways of the country, and officers of the Brotherhood of Locomotive Firemen and Enginemen, at Chicago, on February 28. The request for extra men was made by the brotherhood on October 31, 1936, and negotiations were begun on February 17. It is estimated that 230 new jobs will be created for firemen, with a resulting increase of $445,000 in payrolls. The agreement became effective March 15.

Under the agreement, firemen (helpers) shall be employed on Diesel-electric, oil-electric, gas-electric, other internal-combustion, or steam-electric locomotives, on streamline or main-line through passenger trains which make few or no stops, and on Diesel-electric, oil-electric, gas-electric, other internal-combustion, steam-electric, or electric locomotives, of more than 90,000 lb. weight on drivers, regardless of service. "Locomotives" not included in the agreement are: (a) Electric car service, operated in single or multiple units; (b) gasoline, Diesel-electric, gas-electric, oil-electric, or other rail motor cars, which are self-propelled units (sometimes handling additional cars) but distinguished from "locomotives" in having facilities for revenue lading or passengers in the motor car, except that new rail motor cars henceforth installed which weigh more than 90,000 lb. on drivers shall be considered "locomotives," requiring a helper. If the power plants of existing rail motor cars be made more powerful by alteration, renewal, replacement, or any other method, to the extent that more trailing units can be pulled than could have been pulled with the power plants which were in the rail motor cars on March 15, 1937, such motor cars, if then weighing more than 90,000 lb. on drivers, shall be considered locomotives requiring a helper. (c) Self-propelled machines used in maintenance of way, maintenance of equipment, stores department and construction work, such as locomotive cranes, ditchers, clam-shells, pile-drivers, scarifiers, wrecking derricks, weed burners, and other self-propelled equipment or machines. This will not prejudice local handling on individual railroads where disputes arise as to whether or not the character of work performed by these devices constitutes road or yard engine service.

Rates of pay applicable to coal-burning steam locomotives apply on streamline or main-line through passenger trains except where only oil-burning locomotives are used. Rates of pay for helpers on electric locomotives (from individual or territorial schedules) apply to firemen (helpers) on other types of motive power of more than 90,000 lb. weight on drivers.

Existing agreements which are considered by the employees to be more favorable shall remain unchanged.

This agreement shall continue in effect for a period of one year and thereafter, subject to change under the provisions of the Railway Labor Act as amended.

Supply Trade Notes

The Superior Hand Brake Company, Chicago, has moved its offices to the Railway Exchange Building.

H. W. Porter & Co., Inc., Newark, N. J., has been appointed distributor in the Newark area for the General Refractories Company, Philadelphia, Pa.

The T-Z Railway Equipment Company, Chicago, has moved its offices from 310 South Michigan avenue to 8 South Michigan avenue.

R. B. Hill, a representative of the Lewis Bolt & Nut Company, Minneapolis, Minn., has opened an office at 516 Railway Exchange building, Chicago.

Pierce T. Wetter, vice-president of American Cutting Alloys, Inc., has announced the appointment of Dr. Ing. Paul Schwarzkopf of Reutte, Austria, as the president of the company.

Charles S. Payson, of New York, has been elected a director of The American Rolling Mill Company, Middletown, Ohio. Mr. Payson is also a director of the Rustless Iron Corporation, Baltimore, Md.

Charles R. Hook, president of the American Rolling Mill Company, Middletown, Ohio, has been elected a director of the Rustless Iron & Steel Corporation, Baltimore, Md. The American Rolling Mill Company, which recently acquired an interest of approximately 48 per cent in Rustless Iron & Steel Corporation, is also represented on the board by Calvin Verity, executive vice-president, and W. W. Sebald, vice-president.

E. T. Schroeder, 1205 Syndicate Trust building, St. Louis, Mo., has been appointed sales agent for the Eagle-Picher Sales Company, Cincinnati, Ohio, representing its line of insulating products for railway sales in St. Louis and the Southwest.

J. J. Davis, Jr., sales engineer of the Carnegie-Illinois Steel Corporation at Chicago, has been appointed assistant manager of sales of the railroad materials and commercial forgings division with headquarters at Chicago. Mr. Davis was born on August 3, 1894, at White Pigeon, Mich., and after attending Purdue University and Armour Institute of Technology entered the employ of the Chicago, Burlington & Quincy as a rodman, which position he held from June, 1913, to September of that year. He then entered the employ of the Elgin, Joliet & Eastern at Gary, Ind., where he was a rodman, instrumentman, assistant engineer and supervisor of track during the period until February 15, 1935. On the latter date he entered the general sales department of the Illinois Steel Company, now the Carnegie-Illinois Steel Corporation, as a sales engineer.

(c) *Moffett Studio*

J. J. Davis, Jr.

The Watson-Stillman Company has opened a sales office at 83 South High street, Columbus, Ohio. John C. Grindlay is in charge of this office, and will cover the Kentucky, Southern Ohio and Southern Indiana territory. Richard W. Dinzl has been appointed chief engineer of the Watson-Stillman Company, with headquarters at the main office, Roselle, N. J. Mr. Dinzl recently resigned from the Baldwin Southwark Company, where he had been in charge of engineering for the Southwark division of that company.

H. F. Henriques and J. J. Lincoln, Jr., have been appointed assistant general sales managers of the Air Reduction Sales Company, with headquarters at Cleveland, Ohio, and Pittsburgh, Pa., respectively. Mr. Henriques has been a member of the sales department since March, 1929, and was manager of the Cleveland district from January, 1934, until he assumed his new position in January, 1937. Mr. Lincoln joined the company in 1924 and was appointed manager of the Pittsburgh district

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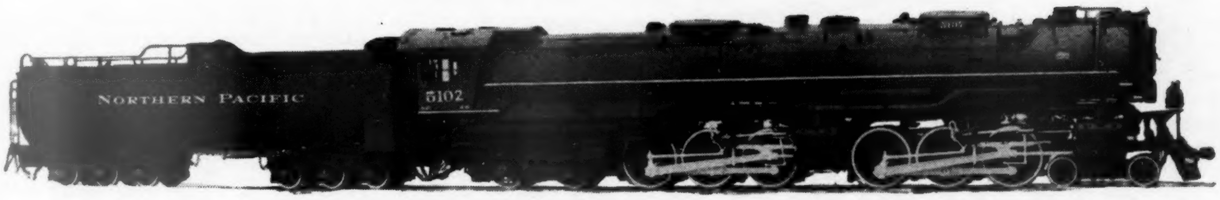


AN IMPORTANT FACTOR

ON

HEAVY POWER!

The Northern Pacific Simple Mallet Locomotives are excellent examples of Modern Power designed for high-capacity, high-speed freight service.

On this power the Franklin Automatic Compensator and Snubber maintains correct adjustment of driving boxes at all times, greatly reduces maintenance costs and materially improves riding qualities.

The Compensator member automatically compensates for wear and box expansion due to temperature change and cushions ordinary shocks while the Snubber member provides a yielding cushioned resistance to excessive blows.

From the time the engine goes into service the driving boxes are constantly in accurate adjustment and this adjustment is automatically maintained without further attention for many thousands of miles.

The Franklin Automatic Compensator and Snubber is an effective operating and maintenance factor on any locomotive—it is particularly important on large power.

Because material and tolerances are just right for the job, genuine Franklin repair parts give maximum service life.

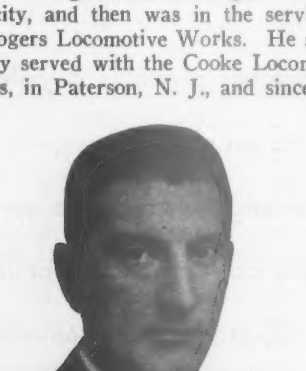
FRANKLIN RAILWAY SUPPLY CO., INC.

NEW YORK CHICAGO MONTREAL

in May, 1934. J. M. Driscoll has been appointed acting manager at Cleveland. Mr. Driscoll has been in the service of Airco since March, 1929, when he joined the sales department. In 1933 he was appointed assistant sales manager of the Cleveland district, which position he has held until his recent appointment as assistant general sales manager. S. D. Edsall has been appointed acting district manager of the Pittsburgh district. Mr. Edsall has been with the Airco sales department since February, 1923, and has been assistant sales manager of the Pittsburgh district since July, 1925. J. F. Pryor, formerly assistant to the general sales manager, has been appointed vice-president of the Magnolia Airco Gas Products Company, a Texas corporation handling all of Air Reduction's activities within that state. Mr. Pryor will have his headquarters at Houston, Texas.

A. Van Hassel, vice-president of the Magor Car Corporation, New York, has been elected president. L. C. Haigh, secretary, and J. W. Leis, plant manager, have been elected vice-presidents, and W. P. Smith and R. C. Warburton, of the general staff, have been elected secretary and treasurer, respectively, all with headquarters at New York, except Mr. Leis, who will be located at Passaic, N. J.

A. Van Hassel was born on November 12, 1889, at Paterson, N. J. He was educated in the grammar and high schools of that city, and then was in the service of the Rogers Locomotive Works. He subsequently served with the Cooke Locomotive Works, in Paterson, N. J., and since 1909 has been associated with the Magor Car Corporation, serving in various capacities, until 1921 when he was elected secretary. In March, 1925, he became vice-president, secretary-treasurer; in 1929, he relinquished the office of secretary. Mr. Van Hassel is also assistant secretary and assistant treasurer of the National Steel Car Corporation, Hamilton, Ont.



Blank & Stoller

A. Van Hassel

Lewis C. Haigh was born in Brooklyn, N. Y., on January 30, 1898. He received his education in the public schools of New York and East Orange and prepared for college at the St. Paul Academy, St. Paul Minn. He also attended Wharton School, University of Pennsylvania, for two years. Mr. Haigh entered the service of the Magor Car Corporation early in 1922 in the shops at Passaic, N. J., and one year later joined its sales force in the New York office. Since October, 1929, he served as secretary of the corporation.

James W. Leis began his career in the steel car business 36 years ago. He served with the Pressed Steel Car Company in Pittsburgh, Pa., for five years, later at that company's Chicago plant for two years and then in Canada with the Canadian Car & Foundry Company. In 1910 he was appointed plant manager.

Edward W. Leahey has been appointed district sales manager of the Ohio Brass Company to serve power utilities, transit companies and steam railroads in Virginia, West Virginia and lower Maryland. Mr. Leahey's headquarters will be in Philadelphia, Pa.

The Bantam Ball Bearing Company, South Bend, Ind., has changed its name to the Bantam Bearings Corporation to describe more clearly its products which include, in addition to ball bearings, taper roller and straight roller bearings. The Bantam Bearings Corporation is now a subsidiary of the Torrington Company, Torrington, Conn.

J. L. Terry, vice-president of the Q & C Company, New York, has been elected president of the company, succeeding F. F. Kister, who was president and treasurer. Mr. Kister has been elected chairman of the board of directors, also retaining the title of treasurer. Both men, as formerly, will have headquarters at New York.

The Oster Manufacturing Co., Cleveland, Ohio, has appointed R. B. Tewksbury, chairman of the board; Roger Tewksbury, president and treasurer; Arthur S. Gould vice-president, and Harry A. Maurer secretary. The first two officers were formerly president, vice-president and secretary, respectively, while Mr. Maurer was general superintendent of the company's plants at Erie, Pa., and Cleveland, Ohio.

John M. Schreiner has been appointed manager of the Detroit, Mich., branch of the Black & Decker Manufacturing Co., Towson, Md., succeeding the late George W. Stoiber. Mr. Schreiner has been active in the Detroit area for the past 12 years. W. J. Fenwick, who for several years has been co-manager of the Cleveland, Ohio, territory, has been appointed manager of all activities in that branch, and G. H. Treslar has been appointed supervisor of the Detroit and Cleveland territories, co-operating with Messrs. Schreiner and Fenwick in the promotion of sales in these areas.

John Graham Morrissey has been appointed sales manager, eastern district, of the Pressed Steel Car Company, Inc., with headquarters at New York. Mr. Morrissey was born at St. Paul, Minn., and attended the University of Minnesota, leaving there to serve in the United States Army during the World War. On his discharge, in 1920, he was employed in the operating department of the Pressed Steel Car Company, at McKees Rocks, Pa. A year later he was transferred to the sales department at New York, where he has been up to the present time.

John May, assistant general manager of sales in charge of electric cables and wire rope of the American Steel & Wire Company, with headquarters at Worcester, Mass., has been appointed general manager of sales, with headquarters at Cleveland, Ohio, Dennis A. Merriman having relinquished his title and duties as general sales manager but continuing as vice-president. Mr. May entered the employ of this company in 1909 in the order department of the New York sales office. He was transferred to Worcester, Mass., and after a short time returned to New York, where, after several promotions, he became, in 1921, manager of sales of electric wire and wire rope. In 1931 he was appointed assistant general manager of sales of electric wire and wire rope for the entire country, with headquarters at Worcester.

John May

Obituary

Edwin J. Rooksby of E. J. Rooksby & Co., Philadelphia, Pa., died on March 17.

Edward P. Burrell, director of engineering of the Warner & Swasey Company, Cleveland, Ohio, died on March 21 at the age of 66.

Frank J. Bauman, steel tool sales manager of the Republic Steel Corporation, died on February 24 at Cleveland, Ohio.

Harold Francis Lane, Washington editor of the *Railway Mechanical Engineer* and other Simmons-Boardman publications since 1916, died of a heart ailment on February 27 at his home in that city. He was 54 years of age. Mr. Lane was born November 2, 1882, at Ashburnham, Mass., and attended the public schools there and at St. Paul, Minn., and Chicago. After being graduated from Calumet High School, Chicago, in 1901, he entered Dartmouth College where he was awarded an A.B. degree in 1905. In the same year he entered the editorial department of the

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former Railway Age then published by the Wilson Company, Chicago. In 1906 he was transferred to the Electric Railway Review, also published by the Wilson Com-

H. F. Lane

pany. After two years in the latter position, Mr. Lane became railroad editor of the Chicago Tribune, a position he held for four years. Meanwhile the original Railway Age had been consolidated with the Railroad Gazette into the Railway Age Gazette, under Simmons-Boardman ownership, and Mr. Lane in January, 1912, became associate editor of the Railway Age Gazette at Chicago. In September, 1916, he was transferred to Washington. While in the Chicago office Mr. Lane edited the 1913 edition of the Biographical Directory of Railway Officials (now Who's Who in Railroading). He was a member of the National Press Club, the White House Correspondents' Association, both of Washington, and the Dartmouth College Club of New York.

Otto Best, who retired five years ago as superintendent and general manager of the Nathan Manufacturing Company's locomotive appliance factory, died on March 4, in St. Vincent's Hospital, New York, at the age of 70 years. Mr. Best, for many years, prior to his association with the Nathan Manufacturing Company, was air brake instructor of the Nashville, Chattanooga & St. Louis. He was also a past president and, for many years, until the time of his death, was treasurer of the Air Brake Association.

Ralph Atlee Light, vice-president and secretary of the U. S. Metallic Packing Company, died suddenly on March 2, at Philadelphia, Pa. Mr. Light was born on November 3, 1892, at Wilmington, Del. He was educated in the public schools and the Drexel Institute in Philadelphia, and in the United States Naval Academy. Mr. Light entered the employ of the United

Ralph Atlee Light

States Metallic Packing Company on April 13, 1905. He became secretary of the company on February 9, 1920, and was elected vice-president on February 19, 1934.

Personal Mention

General

Ralph Simpson, mechanical engineer of the Minneapolis, St. Paul & Sault Ste. Marie, has been appointed to the newly created position of assistant to the vice-president and general manager, with headquarters as before at Minneapolis, Minn. Mr. Simpson has been in railway service

Ralph Simpson

for 30 years. He was born on December 26, 1892, at Stratford, Ont., and first entered railway service with the Grand Trunk (now Canadian National) in September, 1907, as a special apprentice. From March, 1913, to March, 1916, he served in the mechanical engineer's office of the Grand Trunk Pacific, then entering the service of the Soo Line as a mechanic. Following a year in the latter capacity Mr. Simpson joined the Northern Pacific, where he served as a draftsman until July, 1917, when he returned to the Soo Line as chief draftsman. In February, 1923, he was appointed mechanical engineer of the Soo Line.

S. H. Barnhart, assistant to comptroller of the Norfolk & Western at Roanoke, Va., has been appointed assistant comptroller, with headquarters at Roanoke. Mr. Barnhart was born at Shepherdstown, W. Va., and is a graduate of Shepherd College He entered the service of the Norfolk & Western in 1905 in the Roanoke shops and since that time has served successively as machinist apprentice, assistant engineer of tests, wheel shop foreman, engine inspector, assistant enginehouse foreman and assistant valuation engineer In June, 1929, he was appointed assistant valuation engineer in the valuation department and on August 1, 1933, became engineering assistant to the comptroller. Mr. Barnhart was appointed assistant to the comptroller on December 1, 1935.

S. H. Barnhart

G. P. Trachta, division master mechanic of the Chicago, Burlington & Quincy at St. Joseph, Mo., has been appointed district superintendent of motive power of the Chicago, Rock Island & Pacific, with headquarters at Kansas City,

Gerald P. Trachta

Mo. Mr. Trachta was born on October 5, 1883, at Schuyler, Neb. He first entered railway service on December 19, 1901, as an enginehouse sweeper on the Chicago, Burlington & Quincy at Sheridan, Wyo., later becoming a machinist helper and then machinist. He entered engine service

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on March 10, 1903, as a locomotive fireman, being promoted to locomotive engineer on October 5, 1905, and to road foreman of engines on the Sheridan division October 1, 1910. Seven years later he become master mechanic of the Casper division, resigning on December 1, 1919, to accept a position as road foreman of engines on the Arizona Eastern (now part of the Southern Pacific), at Phoenix, Ariz. On March 1, 1923, Mr. Trachta returned to the Burlington as enginehouse foreman at Wymore, Neb., being appointed general foreman at Kansas City, Mo., on August 1, 1923, and master mechanic at Omaha, Neb., on August 1, 1925. Subsequently he was transferred to Galesburg, Ill., and thence to St. Joseph, Mo., being located at the latter point at the time he resigned to enter the service of the Rock Island as district superintendent motive power at Kansas City.

Master Mechanics and Road Foremen

B. R. Carson has been appointed assistant road foreman of engines of the Philadelphia division of the Pennsylvania.

P. R. Logue has been appointed assistant road foreman of engines of the Baltimore division of the Pennsylvania.

C. L. Patterson has been appointed acting assistant master mechanic of the Eastern division of the Pennsylvania, succeeding B. G. Gibson.

W. P. Primm, assistant road foreman of engines of the Baltimore Division of the Pennsylvania, has been appointed assistant foreman of engines, Pan Handle division.

W. G. Wilson has been appointed acting master mechanic of the Illinois and Missouri divisions and the DuPo Terminals of the St. Louis Terminal division of the Missouri Pacific and of the Missouri-Illinois Railroad (part of the Missouri Pacific), with headquarters at DuPo, Ill., to succeed W. C. Smith, who has been granted a leave of absence.

W. B. Embury, master mechanic of the Chicago, Rock Island & Pacific at Armourdale, Kan., has been transferred to Little Rock, Ark., succeeding R. C. Hyde.

A. R. Ruiter, master mechanic of the Chicago, Rock Island & Pacific at Shawnee, Okla., has been transferred to Armourdale, Kan., where he succeeds W. B. Embury.

L. D. Richards, superintendent motive power of the Chicago, Rock Island & Pacific with headquarters at Kansas City, Mo., has been appointed master mechanic at Shawnee, Okla.

M. W. DeWitt, road foreman of engines of the Logansport division of the Pennsylvania, has been appointed road foreman of engines, Toledo division, with headquarters at Toledo, Ohio.

G. B. Pauley, master mechanic of the Alliance division of the Chicago, Burlington & Quincy, has been transferred to the St. Joseph division, with headquarters at St. Joseph, Mo.

J. D. Scott, trainmaster of the Columbus division of the Pennsylvania, has been appointed road foreman of engines, Logansport division, with headquarters at Logansport, Ind.

J. W. West, assistant road foreman of engines of the Philadelphia division of the Pennsylvania, has been appointed assistant road foreman of engines, Conemaugh division.

R. C. Hyde, master mechanic of the Chicago, Rock Island & Pacific at Little Rock, Ark., has been appointed assistant master mechanic at Fort Worth, Tex.

J. S. Williams, general foreman of the Chesapeake & Ohio at Charlottesville, Va., has been appointed master mechanic of the Richmond division, with headquarters at Richmond, Va., succeeding W. P. Hobson, deceased.

C. J. Dietrich, master mechanic of the McCook division of the Chicago, Burlington & Quincy at McCook, Neb., has been transferred to Alliance, Neb. as master mechanic of the Alliance division, including the lines from Alliance to Sterling and from Northport, Neb., to Guernsey, Wyo., on the Sterling division.

E. J. Cyr, general foreman of the Chicago, Burlington & Quincy at Chicago, has been appointed master mechanic of the McCook division, with headquarters at McCook, Neb., where he will also have jurisdiction over the lines from Holdrege, Neb., to Cheyenne, Wyo., and from Sterling, Colo., to Brush, including the Sterling terminal.

Shop and Enginehouse

J. W. Bailey, general foreman of the Montreal shop of the Canadian National, has been appointed superintendent of the Point St. Charles shops, with headquarters at Montreal, Que., succeeding Alexander McDonald, deceased.

F. B. Downey, general foreman of the Chesapeake & Ohio at Huntington, W. Va., has been appointed assistant shop superintendent, with headquarters at Huntington. The position of general foreman has been abolished.

Obituary

Alexander McDonald, superintendent of the Point St. Charles shops of the Canadian National, with headquarters at Montreal, Que., died at his home on February 27, after an illness of a few months. Mr. McDonald was 49 years old.

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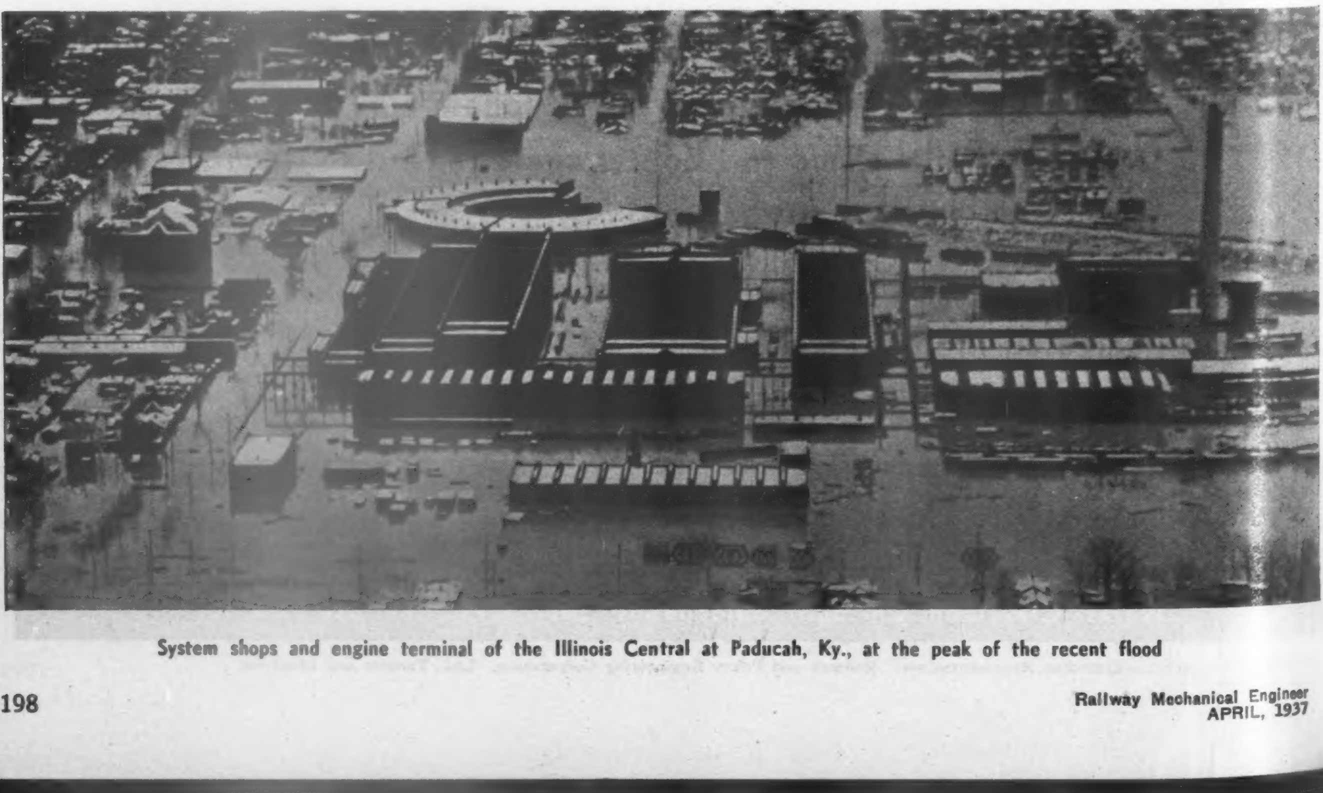

System shops and engine terminal of the Illinois Central at Paducah, Ky., at the peak of the recent flood